# The FLEET OWNER

*In This Issue:*

Truck Operating Costs
Gasoline Specifications
Let Electricity Do It
Question of the Month
Other Features

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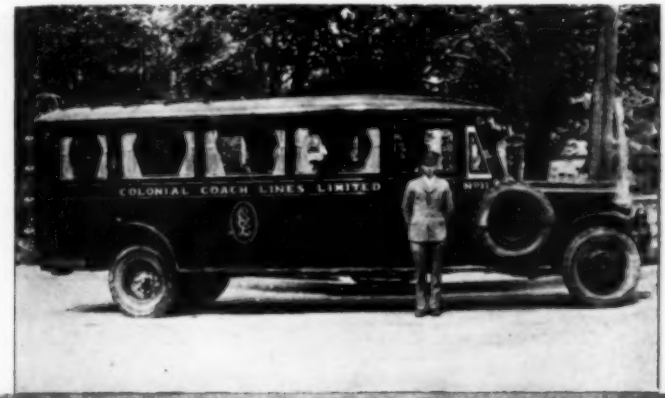


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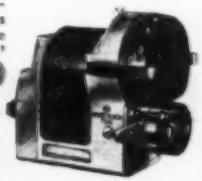

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"For Those Who"

# The FLEET OWNER

"Service Their Own"

*Published Monthly by*

**The Ferguson Publishing Co., 90 West St., New York City**

ARTHUR D. FERGUSON
President

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Sec. and Treas.

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HENRY CLAY FISCHER
Editor

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# *The Curtis Car Washer saves the cost of 5 men*

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# The FLEET OWNER

"For Those Who Service Their Own"

*PUBLISHED monthly in the interests of Automotive Fleet Owners who maintain their own Repair and Service Shops, and devoted to the better operation and maintenance of Trucks, Passenger Cars, Busses and Taxis.*

HENRY CLAY FISCHER, Editor

Vol. 4 New York, February, 1930 No. 2


## Makeshift Horses Are Hazardous

ON the occasion of our first visit to a small fleet shop in the East, we found the foreman and one of the mechanics, both sprawled out under the rear axle of a light truck, making a pinion adjustment. The truck had been raised from the floor, apparently with jacks, although none were in sight.

What impressed us most strongly, was the fact that a beer box was used to support the left side of the truck, while a series of short blocks, about 4 inches wide, carelessly stacked, served to hold up the right side.

Because the fleet was a small one and the equipment of the shop limited, is no reason for two otherwise intelligent men to unduly risk their bodies under two tons of metal. Good jacks are cheap in comparison with insurance premiums and doctor bills. Efficient horses that are *safe* are none too good for any shop, large or small.

Home-made hoisting devices, too, are hazardous. It is dangerous to use an ordinary block and tackle to suspend a vehicle

that is to be worked under. First, because procrastination prevents the rope from being renewed when it wears out and secondly, because oftentimes acid from batteries materially weakens rope, although in many cases an acid-eaten rope cannot be easily detected until it breaks.

There are many makes and sizes of chain hoists on the market, all of which have been duly tested. These can be used for many other purposes around the shop, once they have been acquired. Why jeopardize the lives and limbs of your men, when the proper equipment will facilitate maintenance, get the jobs out on the road in quicker time and keep them satisfied? Savings in this branch of the shop do not pay, and, what is more, they are *not savings*.

---

### Simplifying Ignition Problems

BEGINNING with the first issue of this publication, a practical course in automotive ignition for fleet operators was published. One installment, or lesson, appears in each issue. Surely there is a man in your organization who looks after the electrical work. Pass each copy of THE FLEET OWNER on to this man, and make him a *better* automotive electrician.

---

### The Cover Picture

THIS month on our front cover there appears a picture similar to the one used on the front page of the motor coach time table issued by the Missouri Pacific Transportation Company, St. Louis, Mo.

The picture, in itself, is symbolic of the type of modern equipment used by large railroad companies. It also brings to mind the thought that many railroads are making profitable use of automotive equipment in augmenting the transportation they offer, if not entirely replacing certain routes with various types of motor coaches.

A few figures on this subject, issued by the National Automobile Chamber of Commerce, might be found interesting. This organization reports that there are now three hundred street railways using motor busses, and seventy steam railroads using them. The former own and operate 11,500 vehicles and the railroads 1,900, in this service.

***The Editor.***

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# *How to Figure* Truck *Operating* Costs

## *If You Are in the Trucking Business, You Will Find This Schedule of Costs a Valuable Guide*

**By Ethelbert Favary***

IN figuring truck costs, it is important that the fleet owner consider all the items which make up the operating costs. Some of the items entering into cost accounting are in some cases very difficult to determine—at other times it is comparatively easy to arrive at correct figures.

Cost of operation is classified under two general headings, namely—fixed charges and operating charges. They include the following items, under "fixed charges":

1. *Depreciation of the equipment less price of tires (if figured on yearly basis).*
2. *Interest on investment—(usually taken at 6%).*
3. *Insurance.*
4. *License Tax and other Taxes.*
5. *Garage Rent.*
6. *Administration or Overhead.*

In the second group, we have the operating or variable charges, which depend on the amount of work done. They are classified as follows, under the heading of "variable charges":

1. *Depreciation, less price of tires (if figured on mileage basis).*
2. *Drivers' Wages.*
3. *Gasoline.*
4. *Oil and Grease.*
5. *Tires.*
6. *Maintenance, which includes repairs and overhauling.*

The fixed charges include the items which are incurred regardless of whether the truck is in operation

---

* *Member, Society of Automotive Engineers; Consulting Engineer, Moreland Motor Truck Company.*

or standing idle. The variable charges include only those items which are dependent on the number of miles traveled or the number of hours the truck is in operation. These charges are usually figured in cost per mile of operation, or per ton-mile.

### Depreciation

THE cost of depreciation represents the largest single item in the fixed charges. Unless the operator takes cognizance of the depreciation by a sinking fund to be set aside yearly (monthly or weekly) for the purpose of replacing the truck when it is worn out, he may find himself at the end of four or five years without a truck and without money to purchase a new one. Therefore, all cost accounting systems must consider the depreciation of the equipment which is used.

Depreciation is sometimes figured on a yearly basis, at other times on a mileage basis, and according to the service which the truck is performing—whether it is very severe or ordinary work. When figuring depreciation on a yearly basis it is customary to charge it off at the rate of from 20 per cent to 33-1/3 per cent per annum. Many firms assume a 20 per cent. depreciation in cost accounting, that is to say, assume a truck life of five years.

Depreciation may be figured under variable charges in order to determine costs on a mileage basis as mentioned before. Some people claim that the yearly basis is the more satisfactory, for a certain amount of depreciation takes place even when the truck is standing idle, this no doubt is true when the truck is used only a portion of the time. When the truck is in use daily or covers many miles per week, the "depreciation" per mile will be found more satisfactory.

The reason why some operators disregard depreciation is because it is not something "visible" in daily or monthly expenditures, like the cost of gasoline, tires, etc. and the operator is inclined to forget truck cost once it is paid. When the truck is purchased on instalments, he forgets the cost when the last instalment is paid.

It is sometimes held that depreciation should not take cognizance of the price of the entire truck but that its secondhand value should be considered at the end of the five-year period. It is very difficult to know in advance what the secondhand value of a truck will be at the end of five years as this depends on the kind of work it is used for and the care with which it is maintained. It is therefore recommended that the second-hand value of the

ETHELBERT FAVARY

## How to Figure Truck Costs

(*Continued from page* 11)

truck be neglected when determining operating costs.

While a truck in the hands of certain operators may show a ten-year life, careless drivers may ruin the equipment in a year or two and for this reason we believe a five-year life a good average.

Let us assume the cost of a truck complete but without tires to be $4,000.00. Figuring on a yearly basis a 20% depreciation means that one-fifth of the price of the truck, or $800.00 be set aside annually as a sinking fund. Instead of annually, a pro-rated amount may be set aside monthly, weekly or daily as may be desired.

It is sometimes argued that it is not fair to take a depreciation of 20% yearly because the first year the depreciation of a motor vehicle is considerably larger than the second year and that the yearly depreciation decreases with the age of the truck. This is no doubt true and if desired depreciation may be figured accordingly.

Some firms figure depreciation on a diminishing scale. For instance, they allow 30% depreciation the first year, the second year 30% of the remainder, and so on. In other words, if the price of the truck (without tires) is $4,000.00, they allow $1,200.00 depreciation the first year; the second year 30% of the balance, that is 30% of $2,800.00 which is $840.00, and so on for the five-year period.

The price of tires, as will be shown later, should be deducted from the price of the equipment, as this is included under "variable charges" since tire wear is ordinarily dependent on mileage traveled.

### Interest on Investment

THE next item of "fixed charges" is interest on the investment. This is usually taken at 6 per cent. Interest should always be charged, as money spent for the truck must be considered as an investment. Different methods are used in figuring interest charges. The most common is the straight interest charge for the entire investment, a certain figure per year covering the whole life of the truck. If the life is estimated as five years, 6 per cent of the entire cost of the truck may be figured as interest; hence, if the price of a truck is, say, $4,450, the yearly interest would be $267.

It is thought, however, that a better plan is to deduct each year the depreciation or the total amount of the sinking fund, which has been set aside, and figure interest only on the remaining capital investment. For instance, if the cost of a truck, as stated above, is $4,450 and the cost of tires is $450, set aside 25 per cent per year of $4,000, or $1,000, and the second year interest should be figured on $3,450. etc.

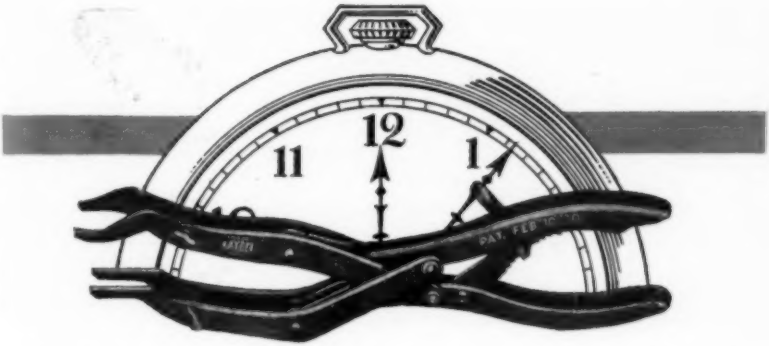
Supposing we figure depreciation at 25 per cent each year, as allowed by Federal Income Tax Commissioner, then we have the following:

(Four thousand four hundred and fifty dollars, less cost of tires) on $4,000. Depreciation and interest on $4,450 investment should be as follows:

| | Depreciation | | Interest on |
|---|---|---|---|
| First year.. | $1,000 | $4,450 | $267 |
| Second year | 1,000 | 3,450 | 207 |
| Third year. | 1,000 | 2,450 | 147 |
| Fourth year | 1,000 | 1,400 | 87 |

If it is desired to charge off depreciation monthly, the interest can be computed monthly.

(*Please turn to page* 64)

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The four K-D Lifters shown here will service your entire fleet. Your shop equipment isn't complete for fast work without them.

Write for Folders on these and other K-D Tools.

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# Fuel Specifications

*Part II—Methods of Purchasing—Kinds Being Purchased —Specifications of the Future, Etc.*

**By Adrian Hughes, Jr.***

IN connection with the discussion of fuel specifications, the first part of which appeared last month, consideration should be given to the method of purchasing fuel: that is, whether it should be bought in bulk and distributed by the user, or purchased at tank-wagon prices and delivered by the oil companies. Considerable difference of opinion on this point exists among fleet operators. Some large firms are using one method and some the other. For bulk purchase it usually is necessary to install storage tanks and operate tank trucks for redistribution. Operators who are using this method feel that they are saving money by it.

We have given careful consideration to this matter in Baltimore, but are still buying on tank-wagon delivery. If money can be saved by the bulk purchase method, we shall change to it, but it should be possible for the oil companies to do the handling more cheaply and satisfactorily than can the operator. This matter should be given consideration by the oil companies. Cooperative study should settle the question whether the fleet operators, as consumers, must go into the business of storing and handling fuel or would save money by leaving this local distribution to the oil companies, which are more experienced in such work.

Whatever way purchases are made, a more satisfactory basis for measuring the fuel should be adopted. A small variation in gallonage in tank-wagon deliveries or even tank-car deliveries may amount to a great deal in the course of a year. Some thought should be given

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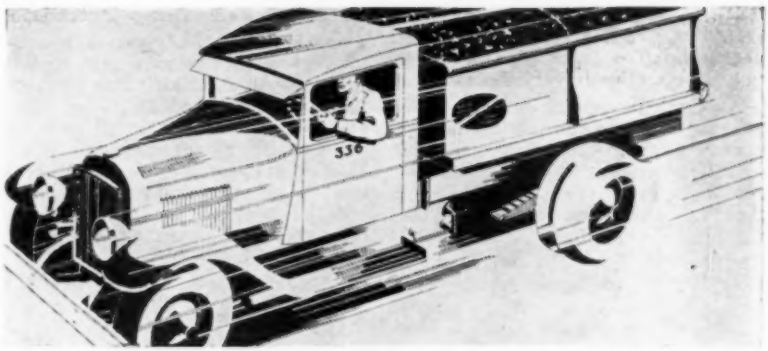
* *Supt. of bus transportation, United Railways & Electric Co., Baltimore, Md.; Member, Society of Automotive Engineers. This paper was read at a recent meeting of the S.A.E.*



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It will cost you about $400 more for a body made of the light, strong Alloys of Alcoa Aluminum. But this $400 will return you a greater rate of interest than any other $400 you have ever invested in trucks.

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# ALCOA ALUMINUM

to the use of a volume correction-factor to correct for change in temperature. The establishment of a uniform practice is very desirable.

Accurate measuring methods also are important in the use of fuel by operating companies, and considerable improvement has been made in recent years by the companies furnishing measuring devices and pumps. This is important, not only to the operating companies in connection with statistics pertaining to their costs and operating efficiencies, but also to the oil companies, as the satisfactory performance of any given fuel is often determined from such records.

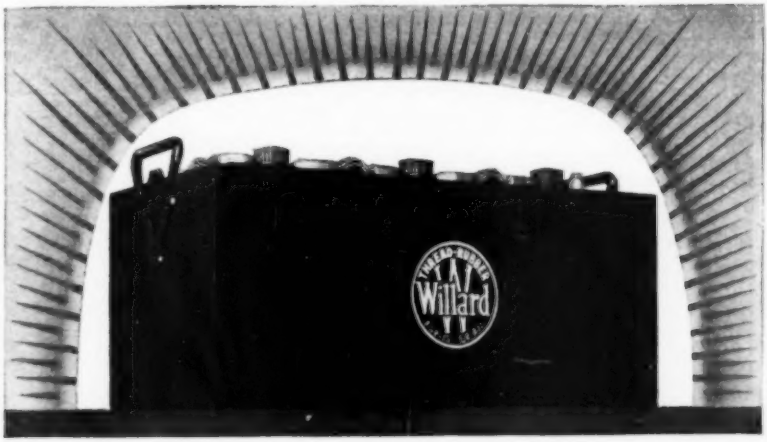
Experiments have been conducted for a period of years to develop a suitable gasoline meter for application to individual vehicles. We are trying out such meters in Baltimore, and if they prove to be satisfactory they will be of great value, not only in testing fuels, but in many other ways.

**Kinds of Fuel Being Purchased**

SOME effort has been made to survey the various motorcoach operations to ascertain what kinds of fuel are being used and why. Replies by 31 companies in all parts of the Country to the question, What kind of gasoline do you use? reveal that, with temperature conditions about the same, for operations in hilly country, 2 used straight gasoline and 1 used blended fuel; for rolling country, 14 used straight gasoline, 4 used blended fuel, 2 used high-test gasoline, and 1 used ethyl gasoline; and, for flat country, 7 used straight gasoline. Thus a total of 23 companies were using straight gasoline, 5 employed blended fuel, 2 used high-test gasoline and 1 used ethyl gasoline. The reasons given by these companies for preferring the fuel each used showed a great variation of opinion.

A need exists for some uniform and reliable method of determining the best kind of fuel for the various operations and the equipment in use.

*Six-cylinder double-decker used in the gasoline tests described in our last issue. The mileage obtained is 3½ m.p.g.*

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**Willard** STORAGE BATTERIES

CLEVELAND·OHIO

## How Baltimore's Largest Motorcoach Fleet Operator Specifies Fuel for Use in His Buses

(Continued from page 16)

The fact is recognized that tests of the kind now being made in Baltimore to find the most effective and economical fuel are not entirely accurate and that the results must be accepted with caution, particularly as between fuels of nearly the same characteristics. Yet, the results obtained in practice are, after all, what the fleet operator is interested in and must, in the end, be the basis for his selection.

I suggest that frank and honest consideration be given to fuel specifications from the purchaser's viewpoint, by engineering representatives of the three interests and a specification or series of specifications be produced which the operator can accept with confidence. It would be unfortunate if the ideas obtained by the operators through these various experiments were to develop at variance with the economic, practical conditions in the petroleum and motor-vehicle manufacturing industries. Cooperation of the kind that has brought such excellent results between the petroleum and the automotive industries can and will produce equally satisfactory results between these two industries and the fleet operators.

The purchasing of fuel in large quantities for fleet operation should be done in fairness to both the operator and the fuel companies. The operator wants to obtain at the lowest possible price a fuel that is best suited to his conditions or his type of engine. He expects the specification to bring in competitive bidding. There is no reason why, in an industry unregulated by public authority, a company which can produce a fuel more efficiently or more economically than another should not be able to profit by that fact in submitting bids.

On the other hand, each oil company wants to know, when submitting its best price for the product specified, that every other bidder

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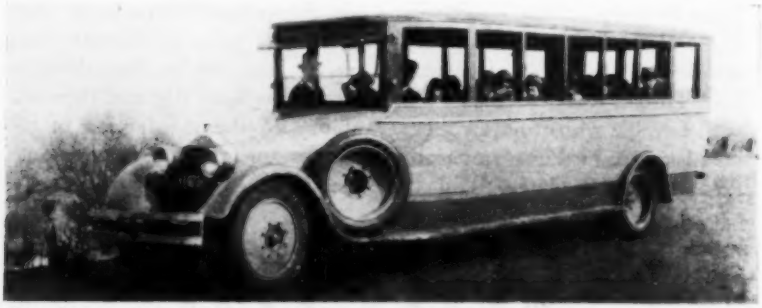

*The four-cylinder busses used in the fuel tests show an average of five miles per gallon.*

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## Hundreds of large fleet owners are cutting costs and improving service by installing new genuine *Packard Lac-kard* Ignition Cable every 10,000 miles.

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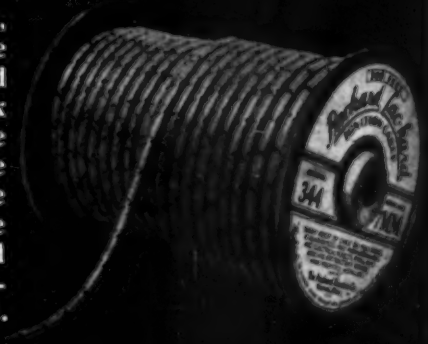


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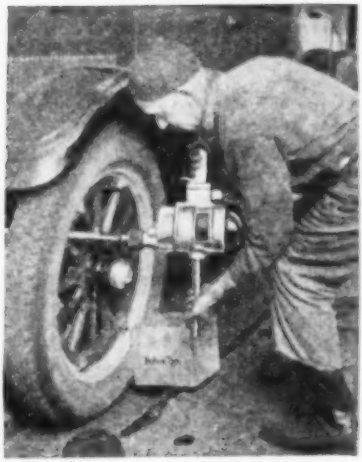

*All of Us Know How to Drill Holes, but There Are Many More Uses for Electrical Tools in the Fleet Service Station.*

**By E. L. Connell**

BETTER service, fast work, keeping the units on the road, and low maintenance costs are perhaps the ideals of every fleet service station. Such results can only be obtained when the mechanics have the proper equipment. To most of our readers this is an old story, as is the story of electricity, which has found its way into every industry, saving much time and labor wherever it has been applied. This article is written to point out how the fleet shop can increase its efficiency through the use of electricity in connection with portable electric tools.

In the manufacture of automotive vehicles there are hundreds of operations which are being done economically with portable electric tools, the manufacturers having adopted these tools in their efforts to meet competition in quality and price. The problem of the fleet service station is a similar one, but it is much more difficult because of the variety and the lack of continuity and sameness in the various operations.

Let us compare a few costs. The cost of operating and maintaining electric tools is but a few cents a day each. On the other hand, the average mechanic's time is worth two cents a minute or more. A saving of ten minutes a day would be sufficient to maintain almost any electrical tool used in the fleet service station and still leave a generous surplus for depreciation.

Every superintendent knows that the cost of power is ridiculously low. The average quarter-inch electric drill will not consume much over two cents worth of power per hour, where the power costs ten cents per unit. On the same basis, a half-inch drill would consume about four cents worth and the ⅝ inch or ¾ inch size, six cents' worth per hour.

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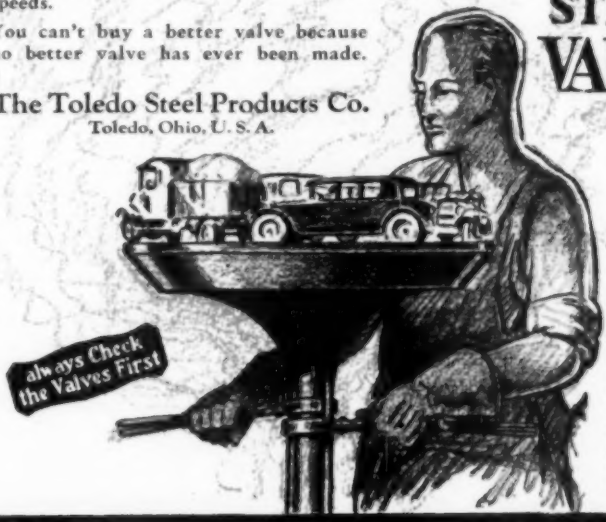
TOLEDO Type "S" VALVES stand the gaff in heavy duty, high compression engines and present day traffic and speeds.

You can't buy a better valve because no better valve has ever been made.

**The Toledo Steel Products Co.**
Toledo, Ohio, U. S. A.




*Toledo Steel Valves are made complete in our own plant, forged at white heat from the world's finest heat resisting steel, machined to the car manufacturers' limits and rigidly inspected.*

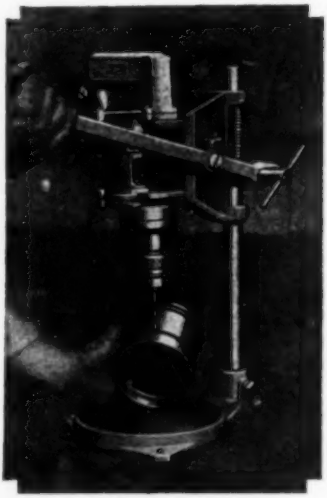
TOLEDO HEAT RESISTING STEEL VALVES

BOLA BLUE PRINT DRAWINGS

find as much work as possible for a servant who will work faithfully for such low wages. The following text and illustrations will perhaps point out new ways of using electric tools in the shop. At any rate, it should bring home the thought that there are many savings to be made through the use of electrical equipment, particularly the portable electric drill.

### The Electric Drill

THE quarter-inch electric drill is almost indispensable in the fleet service station. Space will not permit mentioning more than a few of its applications. As a drill it may be used in the installation of accessories, repairing of fenders, bodies and other parts requiring the use of rivets or screws. It may be mounted in a small stand and used as a small drill press on pistons and other small parts. It may be mounted on the grinding stand with a brush or grinding wheel for cleaning and grinding operations. It may be used as a portable brush for cleaning carbon from cylinder heads and valve guides. It may be used as a source of power for driving valve seat hones.



*Drilling oil-draining holes in pistons is a popular use.*

All fleet service stations should have at least one large portable drill. For the drilling requirements of service work, the ½ inch size is usually large enough although for heavy truck work or the driving of the rigid type of cylinder grinder a ⅝ inch or ¾ inch machine is quite necessary. Very few shops can afford to be without at least one of the three sizes—¼ inch, ½ inch, and ⅝ inch.

There are also many stands available for these larger drills, converting them into very convenient drill presses when needed. The drill stand illustrated in this article can be used upside down for drilling underneath truck bodies, thus saving a very tiresome job by hand.

### Portable Grinders and Sanders

SHOPS which do frequent welding and body repairs cannot afford to be without portable grinding and polishing machines. Most requirements of this work are met with the portable grinder equipped with emery wheels, brush or drum sander, and the flex-disc grinder with abrasive discs or polishing pad.

Every fleet service station of appreciable size must be equipped with one or more stationary grinders for reconditioning tools, cleaning rust from rims, and other tire service requirements. The ideal combination tool should have an abrasive wheel on one end and an extension on the

(*Continued on page* 24)

# Equip every truck with WEEDS...

**Time means money to fleet operation. A truck stalled in snow or mud might cost a day's profits.**

**Equip every one of your motor vehicles with WEED Chains. Be sure you get the genuine. WEED Chains are made for all types and sizes of pneumatic and solid tires. Sold everywhere.**

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# WEED CHAINS

*Removing old paint and rust with wire-wheel brush attachment.*

other end for wire brush or rasp. It should have about 1 H.P., and run at a speed of about 1800 r.p.m.

It may be economy to have an additional small grinder with 6-inch wheel for the light work, such as tool dressing. The 6-inch grinder will need at least ¼ H.P., and should run at a speed of about 3600 r.p.m.

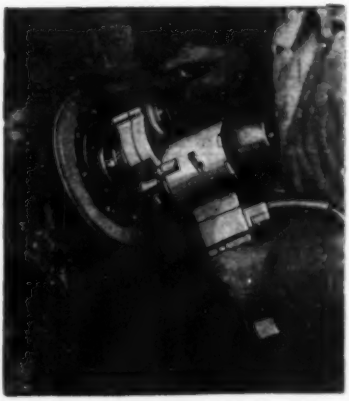
One of the more recent developments in electric tools for fleet service work is the electric socket wrench. Such a machine will spin nuts or cap screws home or remove them at high speed, and at the same time give the mechanic the advantage of a hand wrench for giving proper set to the nut or for breaking it loose. This type of tool is very useful in motor and tire work, wherever there are a number of bolts or nuts of one size to be removed.

No fleet service station can hope to do motor reconditioning work without modern valve grinding equipment. The most important aid in such work is the valve refacing machine.

A valve refacing machine generally consists of a revolving grinding wheel and a revolving chuck, driven by either one or two electric motors, through belting, gearing or other means of drive. The chuck is adjustable to take the various sizes of valve stems and is sometimes adjustable in position, to take valves with any angle of seat. On the other hand, many models of refacing machines will only accommodate valves with 45-degree angles. The latter class is lower in price, of course, while the universal model is more expensive.

The stem of the valve is first properly centered in the revolving chuck and by means of a sensitive screw mechanism, the face of the valve is brought to bear against the revolving grinding wheel, until the face of the valve has been trued up. It is quite important to guard against removing too much metal

(*Please turn to page* 63)



*Resurfacing a damaged body panel with flexible sanding pad.*

# AFTER EIGHT YEARS—STILL USING SKF BEARINGS, SO WE ASKED THEM WHY? HERE'S THE ANSWER

"When you ask about the service we obtain from SKF Bearings we can candidly answer . . . excellent. We have used your bearings for about eight years and in this period of time have not had a complaint from our mechanical department.

"Our slogan is 'Rader for Service,' therefore we must keep our equipment in tip-top shape. When we receive an order . . . there is no delay. We get it out as rapidly as possible. Our trucks are always on the go, travelling over all kinds of roads and into undeveloped sections. The condition of the trucks . . . bodies, tires, brakes and the bearings must be good. SKF's have done very well indeed."

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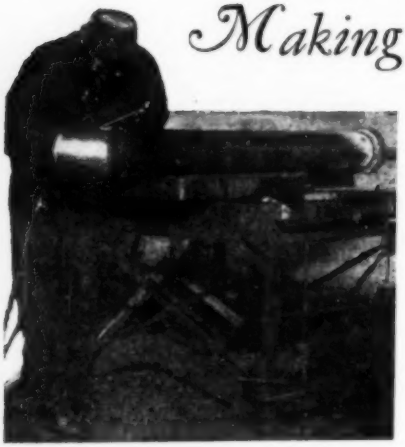


# *Making* Outlet Pipes *for* Tank Trucks

*How Large Fuel Oil Company Makes Up Own Pipes from Steel Sheets*

**By W. I. Gaston**

A LARGE fleet operator whose business is the supplying of fuel oil for domestic and industrial users, has lately hit upon a novel method of making his own outlet pipes, for use on his extensive fleet of automobile tank trucks.

These pipes, or ducts, are made up from sections of steel sheets which are rolled into shape and welded along the longitudinal seams. Two sections are used to make up the length required.

In order to direct the flow into the tank, a three-piece welded elbow is used. This can be clearly seen in the picture at the top of this page which shows the welding operation.

A cast iron connection is welded (with bronze) to the end of the pipe, so that the end can be fastened to the outlet of the truck tank. Small fittings for handling the duct are welded on the sides. The finished outlet pipe is shown in the lower picture.

This job is a typical one that can be performed in the fleet shop that has welding equipment—and every well equipped shop should have it nowadays.

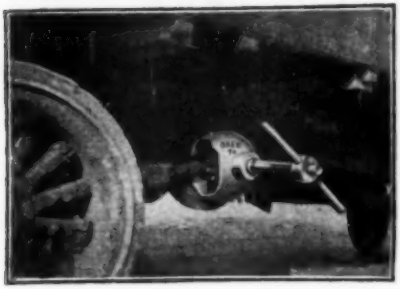
Many fleet operators are finding that it pays to maintain a separate, "centralized" welding shop, where all welding jobs are sent. Such work as burning-out carbon, weld-

(*Please turn to page* 44)

*Finished Outlet, ready for installation*

# For MACK Trucks of All Models—Use

## GREB
## MACK SPROCKET PULLER No. 70



This is a one man Tool, adaptable to all sizes of sprockets on all models of Mack Trucks.

*Made of high grade Steel. Is complete with bar wrench*

**Price $45.00**

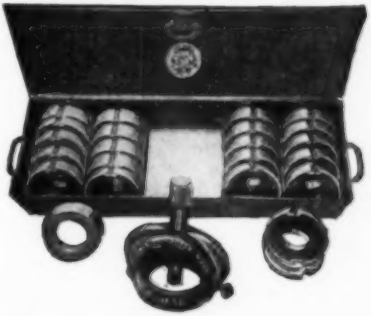
**TEN DAYS' TRIAL**

If your distributor cannot supply you, send us your order. Try it for 10 days. If YOU are not satisfied return it to us and we will refund the money.

*The harder the Pull, the Tighter they Grip*

## GREB UNIVERSAL HUB WHEEL PULLERS No. 64

GREB Universal Hub Wheel Puller Kits render complete wheel removing service and Fit 98% of the Cars and Trucks manufactured.

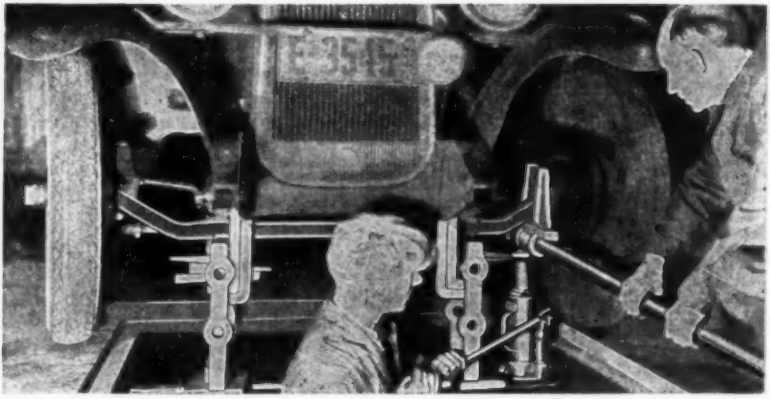


*Positive Pullers for removing the toughest Wheels without breaking gears or injuring threads*

**Price**
**Puller $12.00**
**Adaptors $2.00 each**

## The GREB Co.

**310 STATE STREET** **BOSTON, MASS.**



# *Maybe It's the* Axle *and not the* Wheels

## *Many Cases of Front-End Troubles Can Be Traced to Bent or Twisted Axles—Check Them First*

**By Will Dammann***

PRACTICALLY every fleet owner's service station in the country is equipped with some sort of a device for lining up front wheels—be it an accurate gauge, a "curtain rod" or a stick and string. But a rather small proportion of mechanics are able to do any sort of alignment job that will really correct the cause of the trouble.

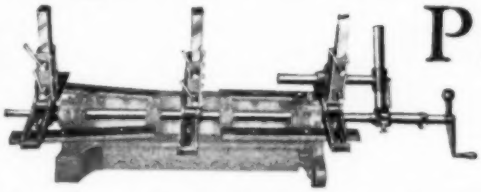
The reason is that but few are acquainted with the fact that many times the real source of trouble is *not* in the wheels, but in the *axle*. The number of cars in service with bent or twisted axles is amazing to any who are not in intimate touch with alignment service and alignment problems.

I should like to impress on every reader of this article the tremendous importance of two things in getting good alignment. The first of these is that when a car has been aligned correctly, the front wheels must turn free and easy. The second is that unless the front axle is first lined up properly, any attempt to correct the wheels is worse than useless.

For some reason the idea has persisted among fleet mechanics that wandering and weaving of the car—a tendency to swing back and forth from side to side on the road—is caused by looseness in the steering. The result is that the first thing

* *Member, Society of Automotive Engineers; President Bear Manufacturing Co., Rock Island, Ill.*

# Bearing Service Equipment *that builds* Profits



## Bore Main and Camshaft Bearings~

The boring of main and camshaft bearings to fit reground shafts opens the way to greater profits through better and more satisfactory overhaul jobs. Many now doing this work can point to profitable repeat business from fleet owners, bus companies, smaller garages, etc.

The Shoemaker Model K Line Boring Tool designed to bore undersize main and camshaft bearings, entirely eliminates hand scraping and fitting. It is a simple, easily operated, low price tool that turns out perfect work. A reground shaft and rebored bearing overhaul job will give as many miles of service as a new factory job. That's why business comes in.

Write for complete information.

*The Federal-Mogul Replacement Line*

**Bronze Back, Babbitt Lined and Die Cast Connecting Rod and Main Bearings (Standard and Undersize)**
**Piston Pin Bushings**
**Connecting Rod Bolts and Nuts**
**Bearing Anchor Screws**
**Bronze Bars and Babbitt Metals**
**Shoemaker Rebabbitting and Line Boring Equipment**

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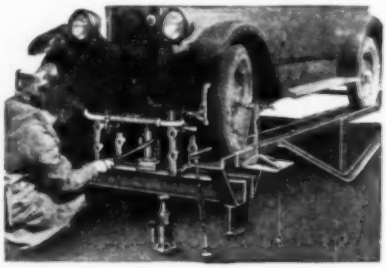
Mogul FEDERAL

many mechanics do is tighten up the entire steering linkage to such an extent that a strong man can hardly drive the car.

Factory tests have time and again demonstrated that this tightening up of the steering parts actually *causes* a great many cases of wandering and weaving, and that easy steering necessitates a certain amount of play in the steering wheel, and freedom from binding in all steering parts.

To check this it is merely necessary to lift the front end of the car on two jacks so that each front wheel has about an inch clearance. Then by grasping the tire of one of the front wheels, it should be possible to turn the wheels from side to side easily and without any considerable muscular effort. Those who are aligning wheels should make this one of the very first tests. Any car which cannot be so turned must be loosened in the steering linkage until the wheels swing free and easy.



*Front axles can be straightened without removing them, by means of jacks applied as shown here.*

It is not sufficient that the wheels turn easily at the steering wheel. The steering wheel gives the driver a tremendous leverage, which is needed when the weight of the car rests on the wheels and the gyroscopic action (present at high speeds) resists turning. When the car is at rest and the front end jacked up, the wheels must swing from side to side easily by grasping the tire.

As a matter of fact, tightening of the steering linkage adds greatly to the difficulty of steering both because it makes the wheels hard to turn, and because it makes it practically impossible, resulting in a wander or weave in the steering.

And now we come to the second important consideration — that of wheel alignment. After tightening the steering linkage, a great many fleet mechanics next proceed to test the toe-in of the front wheels—and after lenthening or shortening the tie rod, turn the car back on the road, to steer harder and shimmy worse than ever, never dreaming that the front axle was at fault. We find from experience in our own service that in more than half of the cars we check, the axle is bent or twisted or has wrong caster (backward tilt).

The reason why axles cause so much more trouble than they did a few years ago lies in the universal use of balloon tires and 4-wheel brakes, and to front wheel brakes must be accorded the greater portion of the blame. A balloon tire on a wheel correctly aligned causes little, if any more drag on the spindle and axle than would the old fashioned high pressure tires. But once any irregularity occurs in the alignment, the balloon tire causes a far greater drag on the axle than would a high

(*Continued on page* 46)

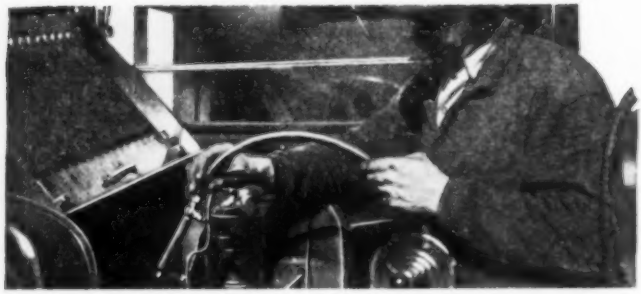
# ASK YOUR CUSTOMERS ABOUT THIS

Pleased customers, repeat customers, new customers! Every far-seeing business man wants these. In the winning of such desirable patronage, prompt, able delivery service plays an important part.

Hundreds of business men have found Dodge Trucks able allies. Regardless of weather or road, Dodge Trucks fulfill delivery promises with certainty. They are geared for time-saving speed and acceleration. They are built for merchandise-safety and merchandise-riding ease. They are good-looking —impressive representatives to the eyes of your customers. They are economical to operate and maintain — throughout their unusually long lives.

Buy a Dodge Truck with assured safety to your investment. It will enable you better to serve customers and thus build goodwill and greater profits for you.

# DODGE TRUCKS



# *How to* "Burn Out" Carbon

## *It is Better to "Lift the Head" But a Satisfactory Job Can be Done with the Oxygen Blowpipe*

IN response to the many inquiries that come to our "Trouble Shooters' Department" asking for the proper way in which to burn out carbon, the following treatise is offered.

While a more complete job could be done by getting the head off, scraping the carbon and perhaps grinding the valves, yet every fleet shop should be equipped to burn out the carbon, if it is so desired. In this day and age when practically every up-to-date fleet repair shop is equipped with oxy-acetylene apparatus, carbon burning should interest owners of such shops, particularly during the busy season of the year when vehicles cannot be spared from service.

Carbon burning is easily performed. The motor should be run for a short while to heat up the block. Then the spark plugs are taken out. The valves in the cylinder from which the carbon is to be burned must be closed during the operation. To get the valves in correct position the motor is turned over by hand; this is a simple matter because with the spark plugs out there is no compression.

Electrical wiring near the spark plug openings should be protected from sparks and nearby painted surfaces should be shielded from the heat by a covering of asbestos paper or some other fireproof material.

A piece of cotton waste is placed through the hole into the cylinder head and ignited to give the operation a start. Then a stream of oxygen is directed into the combustion chamber, using a carbon-burning blowpipe. This has a long flexible brass tube which can be bent around to get at every place within the combustion chamber upon which carbon may be deposited. Oxygen combines with the carbon, freeing the cylinder walls of the deposit.

Where the pistons are of aluminum, special care must be taken to prevent overheating.

The burning procedure is carried

(*Please turn to page* 46)

## KLEMM GOVERNORS

REDUCE Delivery Costs with No Loss of Time

You can hold the speed of your fleet to the limit you set with the Klemm governor. It's always on the job—requires no attention—no lubrication and no upkeep. Can be installed in 15 minutes and fits any truck. Fully guaranteed. Thousands now in use. Send for the facts in Bulletin No. 206 which show that Klemm governors reduce delivery costs.

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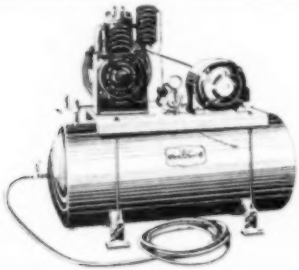
**Try and match this unit for $215.**



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# DON'T FAIL *to* READ THIS:

## *Here is Something New and Different That Bids Fair To Be a Valuable Asset to Every Reader*

PROMPTED by many requests from Maintenance Superintendents, we are pleased to announce, beginning with this issue, a new "club" which will be called "Question-of-the-Month Club." The purpose of this "club" will be to acquaint others as to how "the other fellow" is doing things.

On the page opposite is a form, all ready to be filled out. In order to become a "member" it is simply necessary to participate in these questions and answers, only when you choose to do so, of course. There is *no* fee, *no* dues, and no limitations. You automatically become a member when you answer any question, and should you wish to "resign" you simply stop participating.

To those interested in getting first-hand knowledge of general fleet practice, the advantages of this "club" need not be pointed out. Everyone is interested in what "the other fellow" is doing, and this simple system of getting the real "low-down" should appeal to all. The forms submitted each month will be brief, timely and to the point. We will make it as easy as possible for you to participate and the benefits will be manifold.

*Read*
**The FLEET OWNER**
**Join *the* Club**

*and*
**Enjoy Both!**
**Do It Now!**

As a special inducement, "members" of the club will be privileged to examine a tabulated report, to the extent that this is physically possible. The information will be kept in our files and those answers deemed of most general interest will be published each month in The FLEET OWNER, unless it is stated that certain information shall not be made broadcast. "Members" are aso invited to suggest the next month's question.

Such subjects as maintenance probems, making periodic overhauls, keeping stocks, selecting equipment, purchasing materials, hiring men, keeping down accidents, paying bonuses to careful drivers and efficient shopmen are but a few of the subjects to be taken up.

To make it easy for all, let us start with a comparativey simple question—one that all can conveniently answer. On the opposite page is our first question. A new question will appear each month. We have a lot of good ideas up our sleeve and things of universal interest are promised.

Join the "club" now! Simpy fill out page 35; tear out and mail it to the Editor. Do it now—before you forget it.—*The Editor.*

# Question-*of*-*the*-Month Club

## *Question Number One*

**What Kind of Gasoline Do You Use?**

- Straight Run ☐
- High Test ☐
- Benzol Blended ☐
- Ethyl Blended ☐

*What are some of Your Reasons?* .....

.....

.....

.....

.....

.....

.....

*What is your average mileage per gallon?*

.....*Trucks;* .....*Busses;* .....*Pass. Cars;* .....*Taxis*

*Average monthly mileage per vehicle?*

.....*Trucks;* .....*Busses;* .....*Pass. Cars;* .....*Taxis*

*How many vehicles in your Fleet?*

.....*Trucks;* .....*Busses;* .....*Pass. Cars;* .....*Taxis*

*Name of Firm* .....

*Address* .....

*City and State* .....

*Your Name* ..... *Position* .....

*(Please tear out this page and mail to the Editor)*

*Here is our idea of what good headlights should do without causing glare*

# Care *for Your* Headlights

## *Some Hints on Their Proper Care and Adjustment*

**By Robert L. Zahour ***

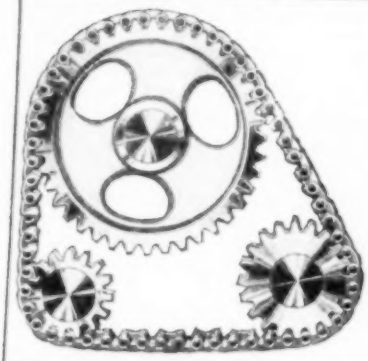
ORDINARILY, the average driver in the fleet cannot detect faulty headlight adjustment of the lights on his car or truck and often he is not aware that his headlamps are detrimental to the vision of approaching motorists. Many fleet owners often proceed to correct improperly focused headlights with various devices such as lenses, shields, etc., which in many instances result in no improvement of the beam spread, but only additional loss of useful light. Others proceed to purchase cheap lenses under the impression that the law must be satisfied with no forethought of the practicability of such a device as a corrective measure.

It must be remembered, that faulty headlight adjustment cannot be corrected by simply installing beam modifying lenses. The value of many reputable beam-spreading or tilting devices is very often misunderstood by the fleet superintendent, because he does not obtain from them the results expected. The very best of beam-controlling lenses (and there are many good ones available) cannot correct stray light dispersion because of a lamp out of focus, improper beam-spread due to dirty or tarnished reflectors, or incorrectly aimed beams.

Before attempting to focus and aim the headlights, the reflectors, bulbs and lenses should be thoroughly cleaned, the sockets freed if they have rusted fast, and all electrical connections cleaned and tightened. A dirty lens or reflector, besides causing loss of light, may be a source of glare. (*Please turn to page 38*)

* *Westinghouse Lamp Company.*

## Duckworth Timing Chains



***To cut down***
**BREAKDOWNS!**

It will pay you big dividends to enforce rigidly the rule that all timing chains must be carefully checked when your cars are in for motor servicing. And it will pay you to specify Duckworth Silent, Shock Absorbing Timing Chains for replacements.

The patented hollow split pins in Duckworth Chains absorb shocks, provide a self-oiling feature, and overcome stretching due to worn link holes. Precision-ground link surfaces add a high degree of accuracy. Arched-back links give reserve strength for the hardest service.

Write for copy of our booklet "Timing Chains, Their Construction, Use and Installation" with complete timing chain specifications on all trucks.

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**Springfield, Massachusetts**

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**and positive freedom from worry when the job is done**

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Easy on and easy off for they don't need shellac.

**VELLUMOID**
THE REAL REPLACEMENT GASKET MATERIAL

*The Vellumoid Co., Worcester, Mass.*

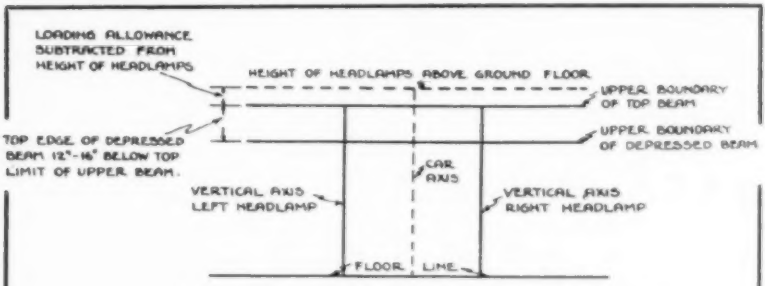
Use ordinary soap and water to wash lamp bulbs and lenses. Replace cracked or broken lenses which in a short time permit moisture in the air to tarnish polished reflectors. Do not use soap and water or abrasive metal polish for cleaning reflectors. To polish reflector surface, prepare a mixture of alcohol and powdered lamp-black, and coat the surface, using a daub of cotton as a brush. Then polish off the lamp-black with a clean piece of cotton. If the reflector is too badly tarnished or corroded to permit satisfactory polishing, replating will be necessary.

Examine headlight reflector to see that the gasket cord, which is provided to make a moisture-tight seal between the lens and reflector, is in place. Ordinary friction tape should not be used as a substitute, as its sulphur content will cause a rapid tarnishing of the reflector. Glue or shellac-varnish may be used to fasten gasket to reflector.

### Check the Bulbs, Too

USE a 21-candlepower headlight lamp, of reputable manufacture, with a closely concentrated filament, accurately mounted in the center and having a corrugated bulb. The bulb corrugations break up filament images which are partly responsible for glare. Blackened bulbs cause a considerable loss of light, and should be replaced with new ones. Be sure that the lamp is held firmly in its socket, otherwise it will wobble as the car bounces along the road. If necessary, the socket walls may be pinched together with a pair of pliers.

Replace cleaned lens so that wording reads properly from the *outside* of headlamp. Carefully follow instructions received with lenses to be sure they are positioned properly. If the lens has a tendency to rotate, a small piece of adhesive tape between it and the door will prevent this motion. When mounting headlamp doors, smear a little grease on the inner surfaces so as to make it easier to remove doors next time.


LOADING ALLOWANCE SUBTRACTED FROM HEIGHT OF HEADLAMPS
HEIGHT OF HEADLAMPS ABOVE GROUND FLOOR
UPPER BOUNDARY OF TOP BEAM
TOP EDGE OF DEPRESSED BEAM 12"-16" BELOW TOP LIMIT OF UPPER BEAM.
UPPER BOUNDARY OF DEPRESSED BEAM
CAR AXIS
VERTICAL AXIS LEFT HEADLAMP
VERTICAL AXIS RIGHT HEADLAMP
FLOOR LINE

TYPICAL DIAGRAM FOR GUIDE IN FOCUSING AND AIMING BEAMS OF HEADLAMPS

To focus lamps, proceed with the following instructions: After dark, place car on a level area with the headlamps 25 feet from a wall or garage door. Cover one headlamp with a robe in order to completely shut off the light while the other is being focused. Most head-lamps are provided with a focusing screw, in

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EXTENSION AND COMPRESSION

*A Spring Assortment that answers the versatile demand of Fleet Owners.*

**3 Assortments**

Save hours of time and many dollars in repair bills

Over 250 Steel and Brass Springs in No. Z Assortment

**Price $3.50**

*Send Order for No. Z*

**The PECK SPRING CO.**

PLAINVILLE CONN.

the back of the case or housing, which, when turned, moves the lamp socket back and forth in the reflector.

With a screw-driver, turn this screw to the right or left until the pattern of light is as shallow as possible in the up-and-down direction, with the top edge sharply outlined. The brightest part of the pattern should occur as near the top of the beam as possible, since this part of the beam illuminates the road at the greatest distance away from the car. Now, focus the other headlamp by repeating this procedure.

### Aiming the Beams

AFTER the lamps are properly focused, the headlamp beams must be aimed. Sight over the radiator cap from the rear window, and place a mark on the wall or garage door in line with the axis of the car. Measure the height of the headlamp centers above the ground or floor and subtract from this dimension, the loading allowance for the type of car, as listed in the following table:

### LOADING ALLOWANCE

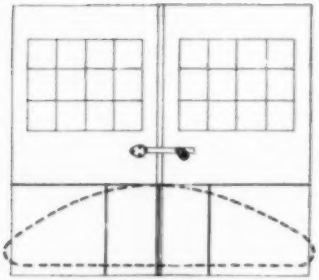
**Passenger Cars**

| Wheel-base | Touring | Sedan | Coupe | Roadster |
|---|---|---|---|---|
| 100-110 | 8″ | 7″ | 6″ | 5″ |
| 110-120 | 7″ | 6″ | 5″ | 4″ |
| 120-130 | 6″ | 5″ | 4″ | 4″ |
| 130-140 | 5″ | 4″ | 3″ | 3″ |

**Trucks**

| | |
|---|---|
| Light Delivery Trucks | 8″ |
| 1 to 3 ton trucks | 5″ |
| Over 3 ton trucks | 4″ |

At a distance of this new dimension from the ground or floor, draw a horizontal line on the wall or door. Through the mark placed on the



BEAM PATTERN OF HEADLAMPS ADJUSTED PROPERLY

wall previously, draw a vertical line to the ground. Draw another vertical line on each side of this first one at one-half the horizontal distance between the headlamps.

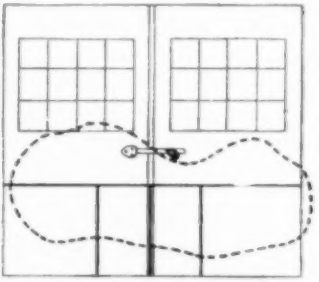
Before proceeding further it might be well to explain the already completed diagram on the wall or door. When a car or truck is loaded, the rear end is forced down due to compression of the springs. The displacement tilts the beams upward into the eyes of approaching drivers. The dimension values given in the above table allow for this beam rise when aiming headlamp beams of an empty vehicle. Referring to the diagram on door or wall, the horizontal line becomes the limiting guide for the top of each beam, and the right and left vertical lines are the center axis of the beams.

Proceed to adjust aim of beams by covering one headlamp as before, and loosen nut which holds the other in place. Center the beam pattern on the vertical line directly ahead so that its upper boundary is on the horizontal line. Holding the headlamp in this position, carefully tighten the nut, and proceed to adjust the other headlamp.

On some cars, such as the older Ford models, it will be necessary to bend the headlamp bracket with a long lever wrench. When the beams are properly aimed, the pattern of both headlamps should be narrow in the vertical position, sharply defined as to its upper boundary, and tapering in brightness sideways.

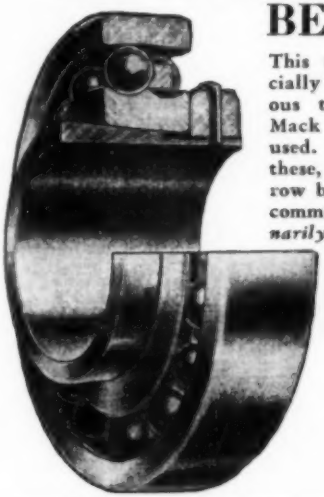
Many cars and trucks of current models are equipped with depressable beam devices which use the new double filament lamp having two 21 candlepower filaments. With these devices, the upper beam obtained from the lower filament, is focused and aimed in the same manner as the fixed beam, single filament lamp previously described. The top edge of the depressed beam produced by the upper filament should strike the screen from 12 to 16 inches lower.

To obtain the most efficient service from the headlamps, a periodic check should be made, particularly in the event of an accident or a fender bump which may throw them out of alignment. Headlamps should be refocused when replacing a burned out bulb. The lenses should be cleaned often, especially when bespotted with mud. Cracked or broken lenses should be replaced to avoid tarnishing of reflector surface.



BEAM PATTERN OF HEADLAMPS OUT OF ADJUSTMENT; LAMPS OUT OF FOCUS; BEAMS AIMED TOO HIGH.

# SELF-ALIGNING BALL BEARINGS



This type bearing is used especially on Propeller shafts in various trucks. In the clutch of Mack Trucks size No. 2215 is used. Stock and Service on all these, as well as on regular single row ball bearings, at your instant command. Prices are *extraordinarily* attractive.

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**BEARINGS INDUSTRY CORPN.**

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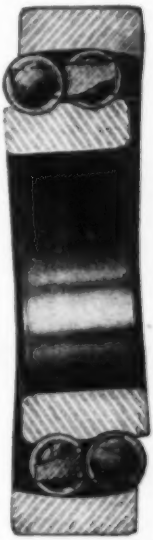


## After All, Experience Goes Right On

proving there *is* no piston like the DELUXE LIGHT WEIGHT CAST IRON PISTON for heavy duty truck work—*and* for passenger car and bus service, too.

THE DELUXE PRODUCTS CORPORATION
1810 Lake Street LaPorte, Ind.

# RECTIGONS

Every battery charged with a Rectigon and a Westinghouse Bulb gives you a lower charging cost

**Westinghouse Electric & Manufacturing Co.**
East Pittsburgh, Pennsylvania

T31079

# New Fire Apparatus by La France

ANNOUNCEMENT of new "Master Series" motor fire apparatus is made by the American-LaFrance and Foamite Corporation of Elmira, N. Y.

The new series is composed of a complete new line of motor fire apparatus, featuring two pumping engines known as the "Metropolitan" and "75," a new city service truck and a complete line of aerial trucks. Production on all the new models is now underway.

Major improvements have been made on all models of the new line, while at the same time proven features of stamina and reliability have been retained.

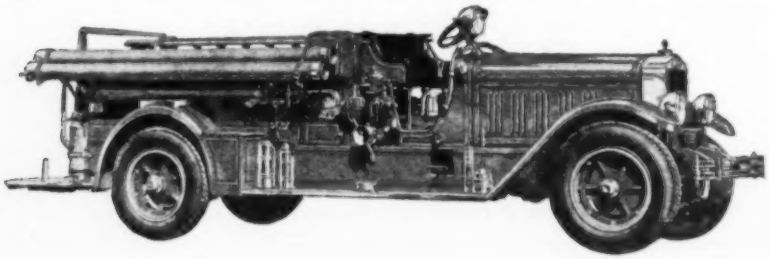
Outstanding among the general improvements in the line leaders are: Left-hand drive instead of right-hand, allowing greater visibility and ease of handling in traffic; new nut and screw steering gear, giving ease of steering; new pressed steel, heat treated frames; specially developed mechanical four-wheel brakes, fully enclosed of the two-shoe type; greater flexibility in springs which are longer and stronger than those formerly used, and hollow spoke cast steel wheels, capable of standing a side thrust of 30,000 pounds.

In addition, all models are streamlined and are fitted with lower running boards, new dash panel for instruments and roomier and more comfortable driver's compartments.

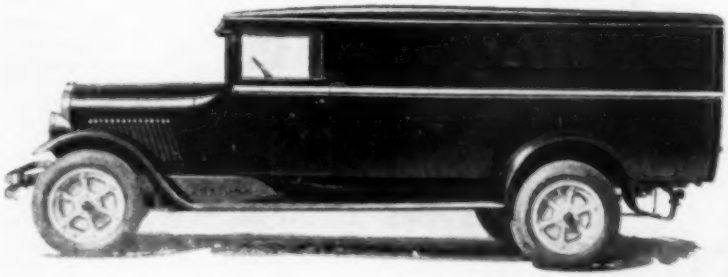
Besides features listed, pumpers of the new line are fitted with a new type cooling system which requires no auxiliary feed line and does not waste any water from the fire pump. This new system is more efficient than that formerly used and in addition to its other advantages it allows the use of anti-freeze solutions in cold weather without loss.

Besides incorporating all the new features found in the other models, the new series of aerial trucks lists many of its own. Most important among these is the feature of one-man control which means that one man can raise and bed the ladder. Both operations can be accomplished in quick time. Raising the main ladder requires but three seconds, while but 20 seconds are needed for lowering. The one-man control feature is an important one irrespective of its speed for it releases other men for duty elsewhere.

In the new aerial models the entire assembly for raising and lowering the ladders is located at one side of the turntable.



# Model A-1 Republic's Latest



## One-Tonner Announced by LaFrance-Republic Is Called Model A-1 and Lists at $990 f.o.b.

LAFRANCE-REPUBLIC has entered the one-ton truck field with a 6,000 pound straight-rating truck listing at $990.00 f.o.b. Alma, Michigan, according to an announcement by vice-president F. L. Pierce.

Outstanding features of Republic Model A-1 are as follows: a 58 horsepower six-cylinder, truck-type engine; four-speed, heavy duty transmission; four-wheel hydraulic brakes, internal expanding; six-inch frame; bevel gear rear axle; 132-inch wheelbase; balloon front tires—truck-type rear tires; generous road clearance; low center of gravity; easy steering; metal spoke wheels; speed; acceleration and operating economy, according to the makers.

Important improvements have been made in the appearance of Model A-1, greatly enhancing its attractiveness. The front fenders sweep gracefully to the running board. The radiator shell is narrower and deeper. The bowl-type headlights have an eleven-inch lens with chromium plated rims. The hood louvers are set at a vertical slant instead of being horizontal.

"Although Republic Model A-1 is priced low, it is a genuine, heavy-duty motor truck in all of its essentials," states Mr. Pierce.

"Model A-1 has been carefully designed by one of the oldest truck engineering staffs in the country. It was developed to meet a wide-spread demand for a low-priced, one-ton truck with sufficient power and strength to withstand severe operating conditions, and we offer it with the fullest confidence that it will more than meet those requirements," Mr. Pierce further states.

Detailed specifications of the new Republic Model A-1 may be obtained by writing to the factory, or to the Editor of this publication if you prefer.

### Promoted to Major

ED. C. WOOD, Superintendent of Automotive Equipment, Pacific Gas & Electric Company, San Francisco, has recently been promoted to the grade of Major, U. S. Army, QM-RES.

Mr. Wood, whose articles on fleet maintenance have appeared from time to time in THE FLEET OWNER, has distinguished himself in the automotive industry in many ways.

After his graduation from being a "pit mechanic" to racing driver, he joined the ranks of the Pacific Gas & Electric Company and has since rapidly advanced.

For several years Mr. Wood has been active in the work of the Society of Automotive Engineers, having been Chairman of the Northern California Section for the past two years. He has also been on the Operation and Maintenance Committee of the S. A. E. for some time.

All of his friends, we are sure, will be glad to learn of the news of Mr. Wood's promotion in Army circles.

A NEW radio for motor cars was first shown during the New York Automobile Show in a special display at the Hotel Commodore. This is a product of the American Bosch Magneto Corporation and will bear the familiar Bosch trade-mark. It is a screen-grid job and has a specially designed speaker for motor-car use.

### Making Outlet Pipes

(*Continued from page 26*)

ing cracked cylinder blocks, broken bumpers, torn fenders, heating parts for straightening, burning-off paint, soldering radiators, tanks, etc., making up special tools and others are but a few of the everyday jobs that welding equipment is being called upon to perform.

### Position Wanted

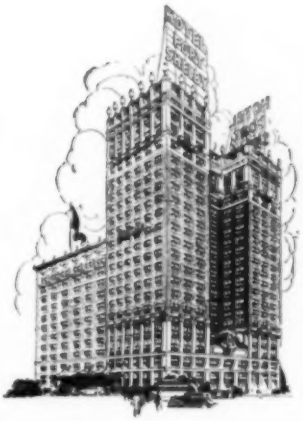
A MAINTENANCE Superintendent, with nine years' experience in fleet shop of a large baking company, writes us that a merger has forced him out of a position. The following quotation from his letter is self-explanatory:

*"I have been employed by a large baking company for 9 years—two years as a mechanic, three years as shop foreman and four years as garage superintendent. By personal supervision and checkup, I have cut my force of 64 men down to 33 in four years. I do not object to where I am located, as I am a widower. Interested in connecting with baking company, milk company, or trucking concern, in maintenance department."*

Any fleet operators desiring to connect with this man may do so by addressing Box 3435, THE FLEET OWNER, 90 West Street, New York City.

Corner of
Lafayette and First

*Look for the large green sign on the roof*



# To Those Who Visit Detroit

In the Fort Shelby is every facility for making your stay in Detroit a very pleasant one—900 reposeful, Servidor-equipped guest rooms, four excellent restaurants, and the thoughtful consideration of your needs.

Whether you choose one of the many excellent rooms at $3, $3.50 or $4 a day, or one of the especially large rooms or suites overlooking the city, or the river and Canadian shore, you will enjoy a particular sense of value in the Fort Shelby. Guests driving to the Fort Shelby are relieved of the care of their cars at the hotel entrance.

## HOTEL FORT SHELBY

Detroit

**Maynard D. Smith,** *President*

**J. E. Frawley,** *Managing Director*

## Maybe It's the Axle

(*Continued from page 30*)

pressure tire, and aggravates the misalignment rapidly.

Most of the front axle misalignment comes from the use of front wheel brakes—now so generally needed as a safety precaution to arrest quickly the new high speeds. Whenever braking pressure is applied, the brake band is tightened on the drum, and the rolling motion of the front wheels is thus suddenly applied to the axle.

Just so long as both brakes grab hold with the same degree of foot pressure, and bind with the same friction as increasing pressure is applied, so long will the strain at both ends of the axle remain the same. But continual use causes a variation in the two front wheel brakes—particularly those of the mechanical type—and soon we have a situation where one brake band becomes tighter than the other, less worn than the other, or grabs hold more quickly. Then application of foot pressure throws extra strain at the end of the axle which has the better brake and any sudden or too forceful application of the foot brakes will twist an axle 1 degree, 2 degrees, 4 degrees, and sometimes even more. When an axle becomes twisted, of what value is it to check wheels for pitch and toe-in? It is impossible to align them properly. *The axle must be straightened first.*

Every day we read in the newspapers of automobile accidents, cars going into the ditch, hitting telegraph poles, etc. It is not generally known that the real cause of many of these is wheels out of line, twisted axles, weakened, worn king-pins and not the "loss of control," which is usually attributed by the newspaper reporter.

There are thousands and thousands of dollars to be saved each month by fleet operators throughout the country, if more consideration be given to wheel and axle alignment.

The tools that are needed are simple and comparatively inexpensive—an axle gauge, that will check the caster or backward tilt of the axle, and a gauge that will show when the axle has been correctly straightened. Yet there are so few fleet shops equipped with these tools—in fact, few shop foremen that know these tools *ought* to be used—that cars are being driven on and on with shimmying, wandering, weaving, hard steering wheels, and tires scuffing away to the breaker strip.

An interesting booklet has been prepared on the subject of wheel and axle alignment. Besides pointing out how wheels should be aligned it gives the proper specifications, such as toe-in, camber and caster for all cars and trucks. If you want a free copy, a request to the Editor of this publication will bring one to you. Ask for the "Wheel and Axle Manual."

## How to Burn Out Carbon

(*Continued from page 32*)

out on all the cylinders of the block and after the spark plugs are put back in place, the car is ready for the road again, with increased power and a much smoother running motor.

Equipment for carbon burning consists of a cylinder of oxygen, a pressure reducing regulator, a length of oxygen hose and the carbon-burning blowpipe. This equipment can easily be paid for from the time saved on the first few jobs.

# A Course *in* Automotive Ignition

*By M. Mallory.*

*President, Mallory Electric Corporation*

## ARTICLE XVIII [*Maintaining Perfect Combustion at All Engine Speeds*]

IT is the general opinion that the explosion within the cylinder is as instantaneous as the report of the exhaust. This is not the case. The compressed mixture starts to burn as soon as the spark occurs, and the flame started by the electric spark spreads until the mixture is completely burned. That is, the electric spark simply sets fire to the compressed mixture in the cylinder, just the same as it would ignite any inflammable material that is not compressed. The exhaust report is really caused by the pressure within the cylinder being released into the atmosphere when the exhaust valve is opened.

Motor fuel under compression is more combustible and burns with much greater rapidity than it would if it was in the open and not compressed. The higher the fuel is compressed, the greater will be the rapidity of burning and power when ignited. The expansion of the mixture by burning also tends to raise the pressure within the cylinder, which in turn increases the rapidity at which the mixture burns.

As an illustration, if the powder from a gun shell is ignited by a match in the open, the burning will be slow and there would be very little disturbance take place, but if the same amount of powder is packed or compressed into a shell, placed in a gun, and then ignited, there will be a powerful explosion, because it is fired in a closed chamber.

As above explained, the power depends largely upon the compression under which the fuel is ignited. For this reason designers of engines have continually worked for higher compression. However, they have been greatly handicapped because with higher compression comes more rapid burning of the mixture, which in turn increases the explosion knock. Therefore, to reduce the compression knock in high compression engines, it has been necessary to retard or decrease the rapidity at which the mixture burns. This has been accomplished to a great extent by using "doped" fuels, that is, fuels that will not burn or expand as fast, or fuels that will not ignite under as low a temperature as ordinary gasoline. Specially shaped combustion chambers are

also used to reduce explosion knocks.

The compression is always the highest on hard pulls or quick acceleration, when the engine is running slowly. This is due to the fact that the piston travel is so slow, and the throttle is sufficiently open to permit a full charge of mixture to enter the cylinder. For this reason the explosion or compression knocks are always more noticeable on pulls or quick acceleration.

### Cause of Compression Knocks

MANY theories have been advanced on this subject. Some engineers contend that the compression knock is caused by an extra explosion that takes place within the combustion chamber. Their theory is that the spark starts the mixture to burn and the flame spreads, forcing the unburned mixture in front of it into one side of the combustion chamber or a pocket.

This unburned mixture is compressed by the burning mixture to a point causing it to explode in front of the flame. This second explosion referred to is more instantaneous than the one started by the spark, causing vibration of the cylinder wall and piston or the "compression knock."

### Mixture Conditions Between Spark Plug Gaps

DUE to the fact that there is such a great variation in the loads, speeds and temperatures under which engines in motor vehicles operate, it is practically impossible to adjust the carburetor so as to maintain the same mixture conditions between and around the spark plug gaps at all times. This presents one of the most difficult problems with which automotive engineers have had to contend.

There are many engines that will not run smoothly over the complete throttle range, that is, there are certain speeds at which the exhaust is not even. This is generally more noticeable at a fast idling speed. The uneven explosions, which can be detected by the exhaust, may also be noticeable when the car is traveling at certain speeds at which the engine will not run smoothly.

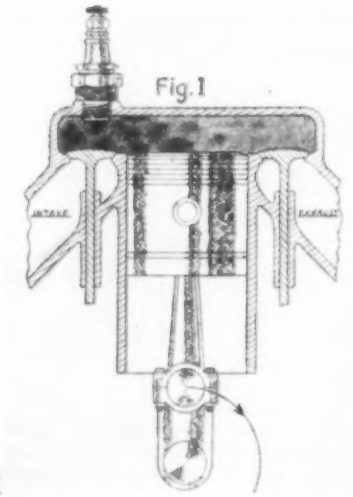
The unevenness of power that causes the car to jerk or the engine to roll is generally due to a stratified mixture condition between the spark plug gaps at the time the spark occurs. For an example, the mixture may have reached a perfect combustible stage around and between the spark plug gaps in one cylinder at the time the spark occurs, but in another cylinder the mixture around and between the spark plug gaps may not have reached a perfect combustible stage at the same time the spark occurs. As the latter explosion would be slower burning, the two explosions referred to would have different effects; that is, the mixture that was ignited when it had reached a perfect combustible stage would burn more rapidly than the mixture that was ignited before it had reached a perfect combustible stage. The result would be that the slowly burning mixture would have the effect of later ignition timing than the rapidly burning mixture, thus destroying the firing balance of the engine.

To obtain a perfect combustible condition of the mixture between and around the spark plug gaps, the throttle must be opened wide enough to permit a sufficient volume of mixture to be drawn into the cylinder. When this is done, especially if idling or not under load, the engine speed increases, and the piston travel is so fast that there is not

enough time for the cylinder to load to a point where the mixture will be uniform in all parts of the combustion chamber. It might be rich enough in some spots, but too lean in others, and, if it so happens that the mixture around and between the spark plug gap in one cylinder is rich and in another cylinder is lean, the explosions will have a different effect in power.

To get perfect combustion, it is necessary that the opening of the throttle be regulated with the speed of the engine. For example, an engine turning at 1,000 R.P.M. might run perfectly smooth under load, while the same engine running at the same speed without load would run unevenly. The reason for this is that, when running under load, the throttle is open wide enough to permit sufficient volume of mixture to enter the cylinders and therefore, a maximum compression in the cylinders and a perfect combustible mixture around and between the spark plug gaps is had. But, when running without load at 1,000 R.P.M., the throttle is only partly open, which does not permit a sufficient amount of mixture to enter the cylinders, and therefore, the compression would be low and the mixture would not be in a perfect combustible stage in and around the spark plug gaps, resulting in unevenness of the engine or a slight miss.

At extremely high speeds, whether under load or not, it is difficult to maintain perfect mixture conditions. This is due to the fact that the pistons are traveling at such a high rate of speed that the inertia of the mixture prevents the cylinders from filling up, even though the throttle is wide open so that the maximum compression and a perfect combustible condition around the spark plug gaps cannot be had. For this



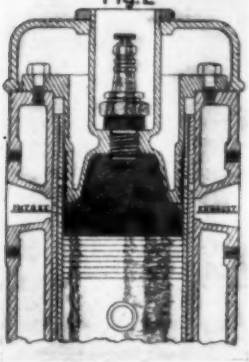

reason super-chargers are used on racing cars.

As a rule the explosions are more even when the spark is retarded. This is mostly due to the fact that the spark occuring later gives the mixture that is drawn into the cylinders more time to reach a combustible stage in and around the spark plug gaps. However, this is not advisable because the full force of the expansion would not completely take place on the power stroke, resulting in the exhaust valve opening before the burning of the gas was completed and causing the engine to overheat.

### Lean Mixture Causes Compression Knocks

AS above explained, a lean mixture burns slowly. This slow burning continues on the complete power stroke or cycle, as indicated by arrows in Figure No. 1. This mixture is still burning when the

Fig. 2




piston reaches bottom center. As the piston starts up, the burning flame is forced out through the exhaust valve, causing overheating of the valve. With too lean a mixture it is always necessary to use more throttle. This admits more air to the combustion chamber, which raises the compression and increases the spark knock.

### Causes of Spitting Through the Carburetor

THIS is due to slow burning. The mixture starts to burn on the power stroke and continues to burn on the upward exhaust stroke until the piston reaches top center. The intake valve opens at this point and the flame flashes back out of the intake manifold. Most all motors do this to a certain extent when the engine is cold, because a cold mixture is slow burning.

### Location of Spark Plugs

THE location of the spark plugs in the cylinders has a great deal to do with the evenness at which the engine runs. If the plugs are located close to the intake valve, as shown in Figure 1, there will always be a fairly rich mixture around and in between the spark plug gap at the time the spark occurs, because the spark plug is in the path of the incoming charge. However, if the spark plug is located in a pocket or a distance away from the intake valve, as shown in Figure 2, a longer time is required for the mixture to reach a perfect combustible stage in and around the spark plug gap. The result is that it is more difficult to adjust the carburetor so that the engine will run smoothly, especially at idling speeds.

### Twin or Dual Ignition

THE difficulties arising from the spotty or stratified mixture conditions between the spark plug gaps can be overcome to a great extent by the use of two or more spark plugs in each cylinder firing at the same instant. As these plugs are in different locations in the cylinder, it is practically certain that there will be a rich mixture between the gaps of at least one of the plugs.

Even though there was a lean mixture between both the spark plug gaps, the burning of the mixture within the cylinder would be much more rapid and complete than it would be if there was only one plug used, because the mixture is fired from more than one point. Still another advantage of two or more spark plugs per cylinder is that if one spark fails to ignite the other spark would, preventing a miss.

### Spacing of Spark Plug Gaps

ALTHOUGH the stratified mixture conditions in and around the spark plug gaps is responsible for many motors running inefficiently and unevenly, especially if only one plug is used, this condition can be greatly remedied by wider spacing of the spark plugs.

For illustrative purposes, Figure 3 and 4 will be referred to. These figures represent two cylinders with the compression and mixture conditions the same, but with a different spark plug spacing. In figure 3 the spark plug gap is set at .015 and in Figure 4 at .035. It will be noticed that there is a variation in the mixture density, that is, it is spotty.

The spark occurring in the spark plug spaced at .015 in Figure 3 would meet only a lean portion of the mixture, which would cause slow burning and incomplete combustion or possibly a miss. But if the spark plug gap was increased to .035 as shown in Figure 4, the spark would meet a portion of the rich mixture, causing rapid burning and complete combustion, thus eliminating the possibilities of a miss.

Although wider setting insures more even running and greater efficiency, there are several things that must be taken into consideration before the spark plug gaps are increased.

There is a limit to the spacing of the spark plug gaps. If they are set much wider than .035, there will be too great a strain imposed on the ignition cable, distributor cap and spark plug insulators, which would likely cause trouble.

Increasing the spark plug gaps tends to shorten the duration of the spark, which reduces the heat.

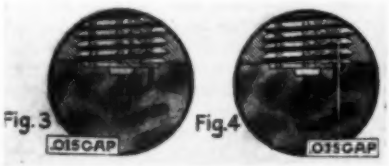
The wider setting causes the spark break down between the spark plug gaps to occur slightly later, which has the effect of later timing, making it necessary to advance the ignition timing slightly.

A plug spacing of .030 or .035 is recommended, because this spacing will not cause any of the trouble above referred to.

Perhaps the most important thing that should be taken into consideration before widening the spark plug gaps is the ignition coil. The insulation between the secondary terminal and primary connections and the ground must be sufficient, so that the secondary current will not leak away from the secondary terminal, due to the greater resistance of the secondary circuit caused by the wider setting of the spark plugs. The coil must be powerful enough to produce a spark across the spark plug gaps of sufficient volume to compensate for the loss of heat due to the wider setting of the gaps. The capacity of the coil must also be great enough to produce a spark of long duration, to compensate for the shortening of duration caused by the wider setting of the spark plug gaps.

Unless the coil is powerful enough to meet the requirements, wider setting of the spark plug gaps causes hard starting and also causes the engine to miss or be sluggish at high speeds and might cause the coil to break down if the insulation between the secondary layers of the coil was not sufficient.

As above explained, the smoothness and evenness with which a motor operates will be greatly improved by widening of the spark plug gaps, providing the coil is powerful enough.




### Spark Duration

SOME coils produce a spark of very short duration. Engines will not idle as well with a spark of

this character, due to the fact that the mixture may not have had time to reach a perfect combustible stage in and around the spark plug gaps by the time the spark occurs. But with a spark of longer duration, that continues to burn between the gap for a longer period, more time is given for the mixture to reach a combustible stage.

Probably no better example can be given of this than a vibrating coil or timer system which causes a shower of sparks to occur between the spark plug gaps for as much as 45 degrees of the fly wheel, although this type of ignition has become obsolete because it is not practicable for the present day high speed engines. The older engines equipped with it generally run smoother at normal speeds.

Even in the non-vibrating coils now commonly used there is a great variation in the spark duration, which greatly affects the operation of an engine. For example, a spark of short duration is low in heat. It might jump the spark plug gap, but fail to ignite the lean mixture in its path, while if the spark was of longer duration and hot enough it would ignite the mixture even though it was lean.

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### Toledo Steel Expands

TO keep pace with changes in the industry, the Toledo Steel Products Co., Toledo, Ohio, has a 200,000 expansion program under way that will make it one of the finest plants of its kind in the country. The latest type of steel forging equipment for high-grade, heat-resisting steel valves is now being installed, according to report recently received.

### Fuel Specifications

(*Continued from page* 18)

will be required to supply the same grade of product he is bidding upon, and that, knowing beyond doubt that this is the case, they will submit honest bids.

### What Future Specifications Must Require

THE indications are that specifications for gasoline for the future shall require:

(1) *Ability to give good starting at the lowest temperature to which it is subjected, to be determined by temperature at the* 10 *per cent point of the A. S. T. M. distillation curve and the slope of the curve at this point*

(2) *That at the* 50*-per cent point the curve shall be low enough to give satisfactory acceleration*

(3) *A high enough temperature at the* 90*-per cent point to give ample power when required.*

In addition, the fuel must have low knock-value and the sulphur content must not exceed 0.10 per cent. The new Federal specifications, test methods and requirements give a fair outline of the possible methods to be used. More important, however, than this is the development of some method by which the operator can perform tests upon samples of the fuel as delivered, to assure him that the fuel has the qualities specified. The operator should not be concerned with what is put into the fuel or how it is refined or blended, but rather with the results that can be obtained from it.

Some test devices are now in use to a limited extent, such as the Midgley bouncing-pin machine for determining anti-knock properties, and the Ricardo machine for deter-

(*Please turn to page* 63)

# The Trouble Shooter

*A DEPARTMENT devoted to correspondence from readers of The FLEET OWNER. Any questions having to do with fleet maintenance will be answered. All properly signed inquiries will be replied to by mail and such of them as are believed to be of interest to other readers will be published in these columns.*

*Address your questions to the Trouble Shooter Editor. We must decline to reply to correspondence not signed with the writer's full name and address. The inquirer's name will not be published.*

## Offers Cure for Clutch

*Dear Editor: I read in a recent issue where a reader was having trouble with a grabby clutch on a model 48 Pierce Arrow truck. I would suggest the following as a possible cure:*

*Get a box of rubber bands, such as are used in a sling-shot, and roll them up into small balls. Separate the clutch cone from the housing, about 2 inches apart, and insert the balls. This will be found to give it a rubber-like cushion and possibly stop the clutch from grabbing.—J. F. Hallowell, Shop Foreman, Pender Grocery Co., Norfolk, Va.*

## A Broken Axle Hint

"MY method of installing a new axle shaft in a Star car, models F & M, 4 cylinder jobs, model R, 6 cylinder job—Jack up both rear wheels and determine which axle is broken by putting car in gear and turning one wheel at a time, holding the others stationary.

"After the broken one is located, take off the hub cap, remove axle nut and wheel—I use a 'knock-out' puller to remove wheel. Remove bolt that holds adjusting nut, back off adjusting nut, take a pair of pliers and pull the shaft and bearing. If axle sticks, tap shaft with a hammer while pulling, remove bearing from old shaft and place on new shaft, care being used that bearing is on tight. Replace axle and bearing in housing, screw up the adjusting nuts until the shaft will not turn, and back off two notches on the nut; install lock and bolt. Slip on the wheel, use a punch and hammer to install the axle key, and put on axle nut *real* tight; also the key.

"If shaft is broken at the inner end, repeat the operation on the opposite side. I use any small rod to push the small piece through. If both axles are removed, install the left side first, ring gear and pinion adjustments being made through the axle shafts, following the above adjustments. Make the right side adjustments only tight enough to take out end play in shaft, care being used that axle will turn free with one hand. Replace wheels, axle keys and nuts."—*H. L. P.*

### This Chart Will be Handy

*Question: I am overhauling and honing a Fargo Truck and would like to get some information on how tight the main and rod bearings should be taken up; also how tight should the wrist pins be if I use cast-iron pistons; how tight if I use aluminum pistons? Can you also tell me what clearance there should be, with both types of pistons? I am referring to clearance between the pistons and cylinder wall. Any information you may have will be appreciated.—A. A., Bogota, N. J.*

*Answer:* Your questions are very interesting and there are no doubt many fleet mechanics who are not sure about one or all of these factors. Clearances depend on the type of pistons used, the type of oiling system that the engine has, and many other factors.

In order to save space, we are sending you, under separate cover, a chart which takes up the following operations: How to Read Micrometers; How to Use a Dial Gauge; Measuring Cylinder Bores; Checking Piston Holes; Table of Decimal Equivalents; How to Fit Iron Pistons; How to Fit Aluminum Pistons; How to Fit Steel Strut Pistons; How to Fit Pins; How to Align Rods, etc. Clearances and other figures are given so that good work can be turned out.

(*Editor's Note: The chart which we sent to this reader is now available for free distribution to any of our readers. It is a handy size and can be tacked on the wall of the shop for ready reference. We have a supply on hand and will be pleased to send free copies, in the interest of accuracy and better jobs. Just write to the Editor and ask for the "Piston Chart" and a free copy will be sent.*)

### He Overlooked the Coil

*Question: We have a Dodge truck that will not start unless we clean the spark-plugs. There are no signs of oil-pumping, but just a sort of brownish black dust on the porcelains of the plugs. It seems that this carbon deposit prevents them from firing, because just as soon as we wipe them off, it will start right up. If we do not, the engine will not start under any condition.*

*We have checked the plugs on a tester and they seem all right. We also have checked the breaker points and distributor head and these are in first-class shape. The trouble seems to be particularly present when the car has been standing out for a few hours at night. It can stand out all day, sometimes, and will not give trouble in starting, but when standing out at night, the plugs have to be scraped before it will start. Is this trouble peculiar to all cars of this make?—E. G. S., Northport, Mich.*

*Answer:* No, this trouble is apt to occur on any car. One of the greatest troubles in hard starting in the winter time can be directly traced to the coil. Even if the plugs and cables are brand new, if the coil does not generate a hot enough spark, the spark cannot reach the plugs and ignite the charge.

In your particular case, the condition of the plugs clearly indicates that the proper combustion is not taking place in this engine because your coil is weak. Even though it might appear to develop a hot spark, there is no doubt that it is defective somewhere and that there is not sufficient intensity of spark to properly ignite the fuel, especially when the engine is cold and damp, and the compression low.

As you know, there is consider-

able leak of secondary current over the surface of the spark plug porcelains whether the coil is weak or strong; if it is weak, this leak is more noticeable and sometimes it prevents easy starting. A perfect, stronger coil will no doubt overcome your trouble.

### Special Services for Glycerine

*Question: Will appreciate any information that you can send me regarding the following: In servicing cars for glycerine, the G. P. A. Radiator Chart has a special note as follows: "We do not recommend the use of Radiator Glycerine in cars with Knight motors or in Nash cars prior to the* 1928 *models, with serial numbers below* 326706 *on advanced models. While many owners of such cars have used glycerine with satisfaction, the servicing required to assure success is not usually available." Can you advise me as to what this special service consists of? —G. G., New York City.*

*Answer:* These instructions were issued by the Glycerine Producers' Association because difficulty was experienced with leaking, *unless* the following "special services" were performed on the Knight and Nash motors:

The Knight engine has rubber gaskets in the cylinder heads. These gaskets sometimes become swollen by contact with hot water in the jackets. When glycerine is used, it has a tendency to restore the old swollen rubber to its original size and it may therefore cause a used rubber gasket that has become swollen by hot water to shrink back to its original size. Therefore, the rubber gaskets on a Knight motor should be very carefully tightened before installing glycerine, or better still, new ones should be put in. If this is not done, a leakage of the radiator solution might occur.

With regard to the Nash cars, we find that the newer models permit the use of glycerine without any special servicing, but on the older models, and particularly the Standard Six up to late 1927, some pump trouble was experienced. Consequently the Nash factory designed a new type of "shedder ring" to be used together with a new style pump packing, that is said to permit the use of glycerine with no danger of leaking. Nash parts stations carry this special part.

Several independent manufacturers of water pump packing have paid particular attention to glycerine, and have developed packings to take care of the situation. I am sending you the names of one or two of these packings by separate letter. (*Names furnished on request.*)

If these instructions applying to Knight and Nash motors are followed, *before* using glycerine, there is no reason why you should have any trouble with leakage. Of course, every gasket, hose-clamp and water connection should also be tightened at this time.

### Wants Information on Fiat Parts

*Question: I am anxious to secure pistons, standard weight, cast-iron, for a Model* 510 *Fiat. Can you tell me where these can be purchased?—W. & G., Bound Brook, N. J.*

*Answer:* Upon looking through replacement piston catalogs, we fail to find this car listed. However, pistons and other parts for this car can be obtained from Domestic & Foreign Motor Repair Company, 352 W. 41st Street, New York City; telephone MEDallion 1279.

We are publishing this information for the benefit of other readers.

## Trouble Shooters' Department *(Continued)*

### Springs Remove the Squeal

*Question: We are readers of* THE FLEET OWNER *and have found some very helpful hints in same. We now want to ask you a question: On a Pierce-Arrow, four-wheel brake car, of 1928, we have had trouble with squealing brakes. We have tried everything imaginable which should remove this trouble, but on this car we can't get rid of the noise.*

*We have used good standard makes of brake lining, but the squealing always came back. We have also inserted "Brake Wafers" and other patented removers, but to no avail. What can you suggest?—C-L Garage, Brooklyn, N. Y.*

*Answer:* The Pierce-Arrow factory has successfully licked this problem by installing endless coil springs over the exterior of each of the four brake-drums. These act on the same principle as the muting of a violin, by absorbing and dissipating the vibration. Packard, Cadillac and several other concerns use the same kind of springs for the same purpose.

The Pierce-Arrow company is in a position to supply these anti-squeal springs (parts number 125198) at a list price of $1.00 each. Complete instructions for properly installing them are furnished with the springs. Your jobber may have these in stock and we would suggest that you try them.

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### The Transmission Is Dry

*Question: We have just refaced a clutch on a 1927 Chevrolet and find a new noise. When the engine is started up cold and we accellerate it to top speed, without running the car, we get a howling noise which sounds like a windy night in March. This seems to come from the clutch. As soon as the motor is a bit warm, it disappears. Can you tell us what it might be?—F. X. Mc., Flushing, N. Y.*

*Answer:* From your description it sounds as though the transmission is either dry or has very little grease in it. Sometimes, when the grease runs low it will congeal into a hard mass and stick in one place, usually on the housing, none of it going to the gears. When the motor warms up, the grease melts somewhat and it travels around with the gears.

Naturally, when the motor is cold you get the whine or hum of the gears travelling around. When it warms up, the grease, as little as it may be, helps to somewhat deaden the noise by being churned by the gears.

The remedy, of course is to fill the transmission, draining it of the old stuff, flushing thoroughly and replacing with a good grade of summer transmission fluid. If this does not solve your problem, we will be glad to take it up with you further.

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### Timing a Knight Motor

*Question: Will you kindly give me the sleeve timing on a model S. 1923 Stearns-Knight? We are replacing both chains and sprockets and do not seem to be able to find any punch marks. How is the chain put on?—Mr. A., Ridgefield Park, N. J.*

*Answer:* Set your motor at top dead center for number one cylinder. Turn sleeve shaft in direction of rotation so that the *outer* sleeve on exhaust side (top) has just closed.

on its way *down*. With both shafts in this position the chain should be applied.

To check up on this, at 4¾" past bottom dead center, the lower edge of the *inner* sleeve, on the way *up*, will have just closed on the junk ring. This distance can be measured on the crank handle, which is approximately the same size as the flywheel. It is important that the sleeve shaft should be turned in the direction of engine rotation, when making the setting.

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### How to Sharpen Drills

*Question: We have a large quantity of old drills around the garage and are about to sharpen them up on a grinding wheel. Can you tell us just how to go about it? Several of our mechanics seem to have different opinions on this subject and we would like to get the real "low down."—C. S., Buffalo, N. Y.*

*Answer:* Twist drills, to operate correctly, should be properly ground and operated at the correct speeds. Never grind a drill by the "eye" alone.

A drill gauge, shown in the illustration, is necessary and not very expensive. The two lips should be of equal length, and ground at an angle of 59 degrees. Each lip should be relieved on a straight angle back of the cutting edge, to a clearance of about 12 degrees. (See diagrams accompanying this article.) Drill gauges are set to an angle of 59 degrees to measure the point angle, and are graduated to measure the lengths of the cutting lips.

*(Editor's Note: The text of this information is contained in a book entitled "Tools That Do the Job Right." The book contains a lot of information on reamers and drills, and also contains a table showing the proper size drill to use for all standard bolt threads. We have a quantity of these books on hand and will be glad to send a free copy to any reader who will write for same. Address the Editor.)*

*The drill gauge is shown at the left; while above are illustrated the correct point and relief for sharpening twist drills.*

# What YOU

## New Products of Interest to Fleet Owners

**Watkins Rebabbitting Service**

THE readers of this publication will undoubtedly be interested to learn that the Watkins Rebabbitting Service, a connecting-rod exchange, is now available through their local jobbers. A brief outline of what this service consists of follows:

The Watkins Company has over a period of years built up a national organization, having 18 operating plants, or "factories", located throughout the country. This service is highly specialized, with the last word in rebabbitting equipment, designed for volume production. All rods of any size can be handled on this machinery, which was designed by the company, for its own exclusive use and is patented.

Under the recently inaugurated plan of operation, automotive jobbers in all sections of the country will carry a stock of rebabbitted rods for the convenience of fleet operators. A fair allowance will be made for old rods returned in good condition.

Watkins Rebabbitting Service is not new. It is well and favorably known by all car manufacturers. The rods themselves are the original rod forgings, made by or for the car maker. Bearing metals, bolts, nuts, shims and bushings are the same or equal to the original ones used. This service is unique in the fact that it does not replace the original part of the car, but reclaims the original rod by building it in accordance with the specifications of the car manufacturer.

It is of interest to note that many leading car makers, such as Buick, White, Willys-Overland, General Motors of Canada, Locomobile, etc., endorse this service by using it themselves, according to the Watkins Company.

With 18 plants located in the principal distribution centers of the country and with over-night service available from any plant, there is no need of carrying heavy stocks of old, obsolete or seldom-called-for types of rods, as these can be secured on short notice.

Fleet owners can get full information, prices, discounts, etc., as well as the name of their nearest jobber, by writing directly to the Watkins Rebabbitting Service, 200 N. Waco Ave., Wichita, Kansas, or if you prefer, you can write to the Editor of this paper.

# U WANT *to* KNOW

### Free Small Tool Manual

THIS interesting book is now being offered to our readers by the Greenfield Tap & Die Corporation, Greenfield, Mass., free of charge.

This book should not be confused with a catalog, as it is really a *manual* that tells the right tool to use for each job in automotive work. The Greenfield catalog No. 29 is also offered.

This book should be in the hands of every fleet repairman. Please mention this publication when requesting same, or, if you prefer, write directly to the Editor, for your free copy.

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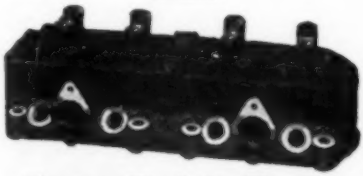

### Simmons Heads for Chevrolet

REPLACEMENT cylinder heads for all models of Chevrolets, up to and including 1927 are offered by Simmons Manufacturing Company. Cleveland, Ohio, in addition to their already extensive line of replacement parts for this popular car.

The dies for the 1928 models are now being made, according to the company, so that heads for these models, as well as for 1929, will shortly be available.

These cylinder heads are exact duplicates of the original equipment head and are thoroughly tested for water leaks, over-weight, etc., before shipment. Catalogs comprising the company's full line of parts for Chevrolets are now available. Write to Simmons Mfg. Co., 3405 Perkins Ave., Cleveland, Ohio, for your free copy, mentioning this publication.

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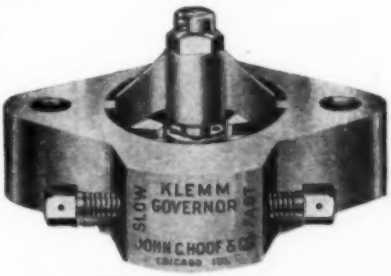
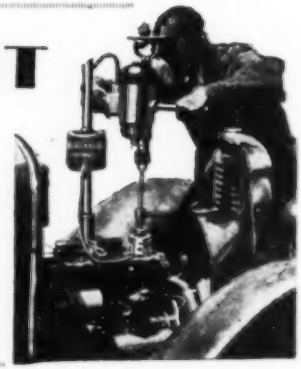



### Klemm Governors

A GOVERNOR for motor trucks is offered by John C. Hoof Company, 162 N. Franklin Street, Chicago, Ill. Its trade-name is "Klemm Governor." It is fully guaranteed.

This governor can be installed in fifteen minutes and requires no attention or lubrication, according to the makers. Those interested will receive a free copy of Bulletin No. 206 by writing to the above company. Mention this publication, if you please.

# EQUIPMENT *for* GARAGE *and* SHOP



## Hi-Lo Pedal Depressor

THIS is a simple device designed to make brake adjustment a one-man job and to save time when making adjustments, usually lost by

having a mechanic sit in the car and hold his foot on the pedal.

The Hi-Lo Pedal Depressor is a product of The Oil-Jack Company, Inc., Ampere, N. J., makers of the well-known "Oil-Jacks." The pedal depressor has a double speed turnbuckle which adjusts itself instantly to any desired pedal tension, and holds it with unvarying pressure. It will pay for itself on the first few jobs, as many of its users testify.

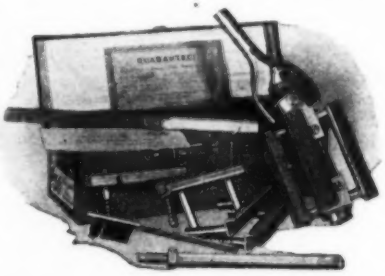
Write for interesting circular, prices and other data, to the above company, or directly to the Editor, if you prefer.

## Sunnen Complete Outfit

HERE is a complete cylinder reconditioning outfit offered by Sunnen Products Company, St. Louis, Mo., at a reasonable price.

The Sunnen Hone outfit shown will handle any job from 2 11/16" to 4¼", with but one set of stones. Special stones are also available to handle big motors up to 6" bore.

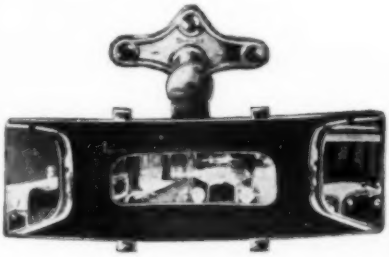
Any half-inch electric drill will operate this hone, it is claimed.



Write to the maker for further particulars, or if you prefer, to the Editor of this publication.

### New Simplex Mirror

A NEW model of the Simplex Mirror that has created a sensation in the accessory world, has just been announced by The Simplex Piston Ring Company of America, Inc., 2103 East 66th Street, Cleveland, Ohio.



The model pictured here is called the "Red Label", designed to fill the demand for a lower-priced mirror for popular cars.

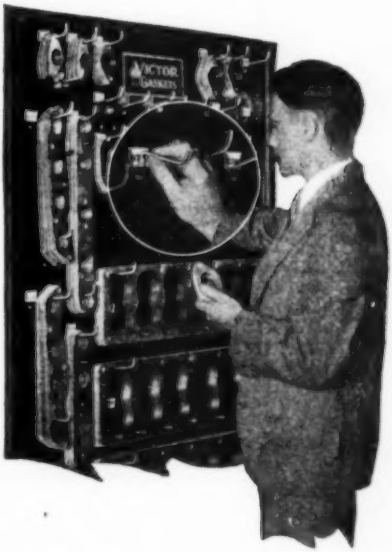
The Simplex Mirror was illustrated and described in detail in our September issue. It is a panoramic rear-view mirror that gives the driver a full view of the road behind, as well as of both sides of the car. The glass is convexed, both vertically and horizontally, having a double curved surface, which, besides giving a full, panoramic view through rear windows, side windows and door windows, also diffuses the light from headlights behind, eliminating glare from that source.

Six months of use has proven the qualities of this mirror. Some literature which comprehensively describes it, is available, free, to our readers. Write to the company, or to the Editor.

### Victor Adjustable Boards

TO facilitate the stocking of gaskets, particularly manifold and small types, Victor Mfg. & Gasket Co., 5750 Roosevelt Road, Chicago, Ill., is providing a new type of gasket board, made of steel in several styles, with adjustable hooks and tag holders.

As illustrated, the feature is the simplicity with which the gaskets are hung. After deciding the best arrangement, the hook is hooked into place, along with the tag holder. No screws, nuts, bolts or nails are used, as a series of closely spaced slots gives wide selectivity in locating the hooks.




Full particulars regarding these gasket boards will be sent on request without obligation. Write to above company, or to the Editor.

### Cables for New Fords

THE Kulier Electric Mfg. Co., 33-22 Northern Boulevard, Long Island City, N. Y., makers of "KEM" ignition products, offers a replacement, insulated sparkplug cable for the new Model A Fords. It is shown herewith.

This product is merchandised in sets, consisting of 4 sparkplug wires, 1 coil cable, rubber nipples and terminals.

The rubber jackets, or tubes are also furnished separately, to be installed on existing equipment.

List prices and further information may be had of the manufacturers by mentioning this publication.

### Valve and Cotter Tools

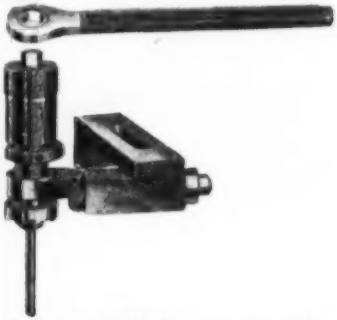
THE Billings & Spencer Co., Hartford, Conn., have just developed a new valve and cotter pin tool, shown herewith.

The jaws hold the cotter pin for inserting; the flat bevelled extremity on the handle spreads the pin while the hooked extremity opposite it pulls the pin out.

The jaws are also suitable for valve work—removing and replacing the valve pins or keys at the bottom of the valve stems.

### Wasco Senior Valve Tool

A NEW model valve seat renewing tool has recently been offered by Inserted Valve Seat & Tool Co., Detroit, Mich. It is called the "Wasco Senior," and is designed to bore out old valve seats to permit the installation of a replacement ring-seat.



The new tool has an extra long spindle bearing, making it self-aligning so that the insert is installed true with the valve stem guide, according to the manufacturers.

Other features pointed out are ball-and-socket joint giving universal action and ball thrust feed screw.

### Oversize Roller Bearing Cups

A NEW line of oversized tapered roller bearing cups has recently been announced by Orange Roller Bearing Company, Orange, N. J.

The new line of cups is standard on the inside bore, taking standard sized cones, but is oversized on the *outside* circumference, allowing for a fit in hubs that are worn too much to take standard cups. The building up and reboring of old hubs is not necessary, if the oversized cups are used, according to the makers.

## Fuel Specifications

(*Continued from page 52*)

mining the highest useful compression. The development of test equipment and methods that can be used in common practice is very desirable.

The automotive engineer might also have a part in the production of suitable specifications. As it is claimed that engine design follows the changes in fuel as produced by the oil companies, the designer must know the relation between various grades of fuel and the engine characteristics.

At present, when equipment is purchased, this information is not offered to the operator so that he can use it in providing the most suitable kind of fuel; in fact, it sometimes is difficult to obtain such information, although in the last year or so, certain vehicle manufacturers have definitely recommended certain grades of fuel. The aid of the manufacturer's engineer would be most helpful to the operator in preparing fuel specifications.

### Four Grades Available

FOUR grades of fuel are generally available, as follows:

(1) *Straight-run gasoline*
(2) *High-test gasoline*
(3) *Benzol-blended fuel*
(4) *Ethyl-blended gasoline*

I should like to ask the vehicle manufacturers to make known which of these four grades they recommend to be used for each model they are now producing. This would influence the operator not to use a fuel which is markedly unsuitable for the engine.

I should like to ask the oil companies to submit a specification and methods of tests for each one of these four grades of fuel. As the operator cannot determine accurately, by any kind of test or experiment, the differences between fuels of about the same grade, it will be better to eliminate any differences; therefore I propose standardization of the grades of fuel. Perhaps we should have five or six grades, but no one can produce good reasons why they should not be standardized.

If these things are done, the operator can be sure of obtaining correct fuel for his equipment and the benefits of the lowest legitimate prices in a competitive market. The motorcoach and motor-truck manufacturers can be sure of the best performance of their equipment up to the limits of its design. The oil companies can depend upon equal and fair opportunity to capitalize their enterprise and efficiency.

This is an ideal, to be sure, but every development in our civilization is the realization of an ideal; this one can be realized through co-operative effort.

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## Let Electricity Do It

(*Continued from page 24*)

or burning the valves. In a few words, this is the story of the valve refacing machine and with a little practice and a good machine, any mechanic can become an "expert" in this line in a short time.

Detailed operating instructions and valuable service information regarding the use of electrical tools, are published by the manufacturers of these machines, and accompany each machine that is sold.

Your jobber, too, no doubt has many of these machines set up for demonstration and from a visit to his establishment you will learn more in five minutes of practical demonstration than might be given here in two or three pages.

# How to Figure Truck Operating Costs

(*Continued from page 12*)

## Insurance; Taxes; Garage Rent and Overhead

THE entire cost of insurance, including liability, property damage, fire and theft, must be charged whether the owner is insured or not. If he is not insured, he is carrying the risk himself and therefore the cost of the insurance should be charged.

License fees, municipal property tax, and all state, county and city taxes applying to trucks, must also be figured.

The item of garage rent must contain the rental charge for garaging the truck. If the operator owns his own garage he must include the interest on the garage investment and depreciation, repairs, light, heat, water, etc., in order to arrive at a fair figure. If the operator's garage is used for other purposes a fair rate would be to set a figure that is charged by an outsider for storing the truck.

Administration or overhead refers to the expense of running the business and includes the salaries of the manager and the clerks, office rent, light, heat, telephone, insurance, etc., which are necessary for the proper supervision of the business. The overhead and administration expenses are divided among all the trucks which the operator owns. If some trucks are more expensive than others, the expense must be prorated accordingly.

## Operating or Variable Charges

WE next come to the second group, which we term the "operating or variable charges," which depend on the amount of mileage the truck covers or the amount of work done. They are:

1. *Depreciation (less tires).*
2. *Driver's wages.*
3. *Gasoline.*
4. *Oil and grease.*
5. *Tires.*
6. *Maintenance, which includes repairs and overhauling.*

The first item under variable charges is depreciation, but inasmuch as we have figured this under "fixed charges", we will go to the next items which are:

## Drivers' Wages; Gas; Oil; Tires

DRIVER'S Wages: If the truck is in operation all day long and the driver does no other work, the amount to be charged under the "cost of operation" is comparatively simple. Sometimes, when the truck is used to perform other work, not incidental to the running of the truck or the loading or unloading, the time should be charged pro rata in accordance with the amount spent while he is operating his vehicle.

When a helper is assisting the driver, the helper's wages must be included under item of "Driver's Wages". Even if the truck owner is driving the truck himself, he should nevertheless figure on the prevailing wages used for that work, for his time should be worth at least as much as that of another driver which he might hire.

The costs of gasoline, oil and grease can easily be figured.

(*Continued on page 65*)

Tires: The item "Cost of Tires" is deducted from the price of the new truck because it represents a "variable cost" depending on the mileage covered. Supposing the tires of a truck cost $450.00 and are operated for 15,000 miles and the operator covers 100 miles per day, then the daily charges for tires would be $3.00

$$\frac{450.00}{15{,}000} \times 100 = \$3.00$$

### Maintenance

THE last item of the "variable charges" is maintenance—including repairs and overhauling. This item depends largely on the kind of work that the truck is used for, the roads over which it travels and the attention it is given. Where the truck is given proper care and is regularly lubricated and inspected, the cost of maintenance and repairs is usually very much lower than where the truck is neglected or not given due attention.

Attention should be called to the fact that in figuring cost of repairs, the entire 12-month period should be considered because the truck may run along for many months without trouble and then have a breakdown which is expensive, hence it would not be fair to charge the amount of repairs monthly.

Usually the first year, the costs for repairs and maintenance are smaller, gradually increasing until it is found more economical to purchase a new truck.

Having considered all the various items we may now figure out an example:

Let us consider a 4-ton truck, the purchase price of which is $4,450.00 complete with body. Let us assume that the truck is delivering daily a 4-ton payload a distance of 50 miles and that it returns empty, thus the total running distance is 100 miles per day for 300 days in the year, or 30,000 miles per year.

The tires for this truck cost $450.00 and are operated say for a distance of 15,000 miles. We shall figure straight depreciation at 25% per year, as allowed in the federal income tax reports.

**Fixed Charges per Day**

| | Per day |
|---|---|
| Depreciation (less tires) 25% of $4,000 | $3.33 |
| Interest, 6% on $4,450.00 | 0.89 |
| Insurance, $150 per year | 0.50 |
| License tax and all other taxes, $90.00 per year | 0.30 |
| Garage Rent | 0.30 |
| Administration and overhead per truck | 0.60 |
| Total fixed charges | $5.92 |

**Variable Charges per Day**

| | Per day |
|---|---|
| Driver's Wages | $6.00 |
| Gasoline, 15 gallons at 20c | 3.00 |
| Oil and grease | 0.25 |
| Tires, $450 for 15,000 miles (or 100 miles per day) | 3.00 |
| Maintenance, including repairs and overhaul, 2c per mile | 2.00 |
| Variable charges | $14.25 |
| Fixed charges | 5.92 |
| Total | $20.17 |

The total expense of running the truck is thus $20.17 per day. As we have included depreciation sufficient to renew the truck when it is worn out, it will be possible to run this truck indefinitely at this cost, in fact the cost will in reality be considerably lower, for at the end of four years the truck will still have a certain resale value. If the operator

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### How to Figure Truck Costs

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uses the truck after four years, instead of deducting the $1,000.00 per year depreciation, the item can be figured as extra profit, and there will be no interest charges in the cost of operation. It should also be noted that we allowed $600.00 per year for repair and overhaul. This figure is usually considerably lower unless the truck is abused.

### Income

LET us first figure the regular load, which amounts to four tons per day for 300 days of the year and that the amount received by the operator for the 50-mile haul is $8.00 per ton or for four tons, $32.00 per day. Let us also assume that the truck is returning empty. $32.00 less costs of $20.17 equals $11.83 per day or for 300 days, $3,549.00 per year. This in itself is a very good return on an investment of $4,450.00. In addition, if there are return loads it will increase the profit accordingly, but we have assumed that the truck is empty for one-half of the running time.

The reason why some fleet owners cannot show any profit at the end of the year is due to the fact that they do not set aside the required sums for depreciation. When their revenue per day is $32.00, they deduct the amount spent for gasoline and oil and the balance they figure as profit for that day. If instead, they would figure their cost as given on the preceding pages, they would know all the time what their costs really are, what actually is profit; at the end of the year their business would be in sound condition and when their truck is worn out they would have the money available to replace it.